26 April 2019

Ms. Emma Best
MuckRock News
DEPT MR 61118
411A Highland Avenue
Somerville, MA 02144

Reference: F-2018-02620

Dear Ms. Best:

This is a final response to your 20 September 2018 Freedom of Information Act (FOIA) request for the following records: **copies of internal studies regarding the Agency's cartography division, including but not limited to: Cartography Division, OBGI; Overview, 1941-1952 and Cartography Division, OBGI; Overview, 1952-1972.**

We completed a thorough search for records responsive to your request and located the enclosed two documents, consisting of 259 pages, which we can release in segregable form with deletions made on the basis of FOIA exemptions (b)(1), (b)(3), and (b)(6). Copies of the documents and an explanation of exemptions are enclosed.

Additional material was determined to be currently and properly classified and must be denied in its entirety on the basis of FOIA exemptions (b)(1), (b)(3), and (b)(6). Exemption (b)(3) pertains to information exempt from disclosure by statute. The relevant statutes are Section 6 of the Central Intelligence Agency Act of 1949, as amended, and Section 102A(i)(1) of the National Security Act of 1947, as amended.

As the CIA Information and Privacy Coordinator, I am the CIA official responsible for this determination. You have the right to appeal this response to the Agency Release Panel, in my care, within 90 days from the date of this letter. Please include the basis of your appeal.

If you have any questions regarding our response, you may contact us at:

Central Intelligence Agency
Washington, DC 20505
Information and Privacy Coordinator
703-613-3007 (Fax)

Please be advised that you may seek dispute resolution services from the CIA's FOIA Public Liaison or from the Office of Government Information Services (OGIS) of the National Archives and Records Administration. OGIS offers mediation services to help resolve disputes between FOIA requesters and Federal agencies. You may reach CIA's FOIA Public Liaison at:

703-613-1287 (FOIA Hotline)

The contact information for OGIS is:

Office of Government Information Services
National Archives and Records Administration
8601 Adelphi Road – OGIS
College Park, MD 20740-6001
202-741-5770
877-864-6448
202-741-5769 (fax)
ogis@nara.gov

Contacting the CIA's FOIA Public Liaison or OGIS does not affect your right to pursue an administrative appeal.

Sincerely,

Riggs Monfort
Information and Privacy Coordinator

Enclosures

Explanation of Exemptions

Freedom of Information Act:

(b)(1) exempts from disclosure information currently and properly classified, pursuant to an Executive Order;

(b)(2) exempts from disclosure information which pertains solely to the internal personnel rules and practices of the Agency;

(b)(3) exempts from disclosure information that another federal statute protects, provided that the other federal statute either requires that the matters be withheld, or establishes particular criteria for withholding or refers to particular types of matters to be withheld. The (b)(3) statutes upon which the CIA relies include, but are not limited to, the CIA Act of 1949;

(b)(4) exempts from disclosure trade secrets and commercial or financial information that is obtained from a person and that is privileged or confidential;

(b)(5) exempts from disclosure inter-and intra-agency memoranda or letters that would not be available by law to a party other than an agency in litigation with the agency;

(b)(6) exempts from disclosure information from personnel and medical files and similar files the disclosure of which would constitute a clearly unwarranted invasion of privacy;

(b)(7) exempts from disclosure information compiled for law enforcement purposes to the extent that the production of the information (A) could reasonably be expected to interfere with enforcement proceedings; (B) would deprive a person of a right to a fair trial or an impartial adjudication; (C) could reasonably be expected to constitute an unwarranted invasion of personal privacy; (D) could reasonably be expected to disclose the identity of a confidential source or, in the case of information compiled by a criminal law enforcement authority in the course of a criminal investigation or by an agency conducting a lawful national security intelligence investigation, information furnished by a confidential source ; (E) would disclose techniques and procedures for law enforcement investigations or prosecutions if such disclosure could reasonably be expected to risk circumvention of the law; or (F) could reasonably be expected to endanger any individual's life or physical safety;

(b)(8) exempts from disclosure information contained in reports or related to examination, operating, or condition reports prepared by, or on behalf of, or for use of an agency responsible for regulating or supervising financial institutions; and

(b)(9) exempts from disclosure geological and geophysical information and data, including maps, concerning wells.

April 2012

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Only CD Copy

Secret

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CIA HISTORICAL STAFF

The Directorate of Intelligence Historical Series

CARTOGRAPHIC SUPPORT TO CURRENT INTELLIGENCE 1951-1970

Secret

OBGI-13

December 1972

Copy 1 of 4

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THE DDI HISTORICAL SERIES

OBGI-13

CARTOGRAPHIC SUPPORT TO CURRENT INTELLIGENCE
1951-1970

by

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(b)(6)

December 1972

(b)(6)

John Kerry King
Director
Basic and Geographic Intelligence

HISTORICAL STAFF

CENTRAL INTELLIGENCE AGENCY

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CARTOGRAPHIC SUPPORT TO CURRENT
INTELLIGENCE, 1951-1970

I.   Introduction

Current intelligence is a primary concern of
the CIA and has been of great interest to the
White House ever since the central intelligence
concept was adopted in 1946. A number of differ-
ent publications and a variety of other means have
been used to convey current information, with maps
and graphics playing an increasingly important
role over the years. The Cartography Division
(CD) has been associated with current intelligence
publications since 1951, and in a particularly
intimate way since 1965, designing and producing
thousands of maps and graphics to illustrate the
spatial aspects of current events.

This monograph traces the Cartography
Division's participation in current intelligence
activities. It will show how the need for the use
of ever more all-source materials, for greater
speed in production, and for greater simplicity in

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format became a pervasive force which required
ever increasing sophistication on the part of map
producers and consumers alike. Running parallel
to this will be the story of how several quasi-
independent and often competing graphics groups
associated with current intelligence in one way or
another were slowly but surely brought together by
1970 in the interest of administrative efficiency.

By and large, CIA's top management has
always encouraged high-quality graphics products,
and in the Cartography Division it has had a team
of motivated professional cartographers accustomed
to be in the lead in their field. In 1951, a very
small group of cartographers was separated from
the main unit, then called the Cartography Branch,
to service the special requirements of offices
within the Special Center. There, for over 19
years, it grew in importance and responsibility as
the Agency placed increasingly greater emphasis on
current intelligence production. To many people
within the Center, the small unit was the only
visible portion of the entire Cartography Division,

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though the job it was doing would have been
impossible without the technical and research
support of the larger unit. First as the
Cartographic Support Section, then as the Special
Support Branch (GC/X), and later as the All-Source
Branch (CD/X) -- all usually known simply as "X
Branch" or "Graphics" -- the unit turned out tens
of thousands of specialized maps and graphics for
a wide variety of requesters.

There was also a group of artist-
illustrators within the Center, housed in the
Office of Current Intelligence, which had existed
under a similar wide variety of organizational
names, sometimes in one unit, sometimes as separate
units. The identity of these units was often
confused with the All-Source Branch by casual
observers. The responsibilities and methods of
operating of the two groups were quite dissimilar,
however, and the story of their relationships with
each other prior to their merger into one unit in
1965 is an essential part of this monograph.
After the merger, a symbiotic effect occurred

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between the two professions -- artists and cartog-
raphers -- that enabled the All-Source Branch
(called CD/X after the merger) to achieve
considerable acclaim in the production of high-
quality specialty maps and graphics.

Throughout the period, the search for better
methods of communicating vital information with an
accent on brevity spurred an increased reliance
upon graphics to tell essential parts of the story.
Significant advances in cartographic technology,
international crises requiring particular kinds of
graphic products, and the strongly stated personal
preferences of highly placed individuals -- in-
cluding Presidents and Directors -- caused profound
changes in the way things were done. No senior
official was more influential in this respect than
Mr. Richard Helms, both as Deputy Director and as
Director of Central Intelligence. His pointed
comments and continuing interest in effective
graphics led to the development of several unique
publications for the use of the President containing

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information of the most vital nature and relying extensively on maps and graphics to portray it.

At the beginning of the period, in 1951, the noun "graphic" -- meaning a picture, map, or diagram used as an illustration -- did not even appear in dictionaries. At the conclusion of the period, in 1970, graphics were an integral part of every major Agency publication, contributing in a major way to fulfilling the DCI's responsibility to inform the government on the significance of events taking place around the world.

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II. Where Things Stood in 1951 .

A. The Earliest Current Intelligence Publications

President Truman's penchant for conciseness
caused him to rebel at the mass of material
crossing his desk dealing with intelligence in one
way or another. In January 1946 he called upon
Admiral Sidney W. Souers, Director of Central
Intelligence in the newly created Central
Intelligence Group, to have prepared for him a
daily selection of items coming into Washington
from all sources which would serve as a summary of
the really important matters he should be aware
of. 1/* The advent of the first such selection on
15 February 1946 put Central Intelligence squarely
into the business of producing current intelligence
reports for high-level consumers. Even so,
Secretary of State Byrnes immediately protested
that the daily Intelligence Summary was an invasion
of his prerogatives. The President held firm, and

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*For serially numbered source references see Appendix.

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the National Intelligence Authority later made the preparation of such a summary mandatory. 2/

A small Central Reports Staff in the Office of Reports and Estimates (ORE) produced the President's Intelligence Summary, with support from all other parts. of the Office. In December 1949 another group -- ORE's General Division, set up for the specific purpose of handling COMINT material -- also began to produce a current intelligence publication. Following General Walter Bedell Smith's reorganization of the Agency when he became DCI in late 1950, two separate groups continued to prepare two separate dailies -- one a COMINT-only edition and one a collateral-only edition. This arrangement satisfied no one, and on 15 January 1951 the Office of Current Intelligence (OCI) was set up to. produce current intelligence based upon facts and figures marshaled from all sources. Headed by Mr. Kingman Douglass, it consolidated the two predecessor groups.

In late 1951, Mr. Douglass described the activities of his Office as follows:

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1. Prepares a daily, high-level bulletin for the President and a half-dozen other officials.

2. Responsible for daily briefing of the President and the DCI.

3. Maintains a Situation Room in which maps and charts of key areas and important developments in many fields affecting national security are kept up to date.

4. Publishes a Daily Digest for general use; two weekly summaries dealing with developments of current importance; and periodic intelligence memoranda collating the most recent information on vital situations. 3/

The Current Intelligence Bulletin (the "CIB") got off to an auspicious start in 1951. The first edition was flown to President Truman who was vacationing in Florida. He immediately wrote DCI Smith, "You have hit the jackpot with this, Bedell." 4/ By 1952 the publication was going to the highest levels of government, but though maps frequently would have been useful, the severe time restraints posed an almost insuperable barrier to getting them in.

The first maps appeared in both the daily Current Intelligence Bulletin (CIB) and the weekly Current Intelligence Review (CIR) in August 1951.

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(b)(3)

(b)(3)

The first CIB map did not appear until the publi-
cation had been underway for almost six months,

(b)(3)
(b)(1)

then a map of ⬚

⬚ was run in the 5 August 1951 edition

(b)(3)
(b)(1)

(see Figure 1). The first CIR map, ⬚ , was

included in the third issue, 15 August 1951. These

(b)(3)
(b)(1)

maps -- rather crude by cartographic standards --
were made possible by the switchover in printing
from ditto to multilith, an offset process, when
ORE's Intelligence Summary was supplanted by the
CIB. Responsibility for producing this type of
map fell to the artists attached to the Situation
Room Division of OCI.

B. Cartographic and Graphics Units

Rigid security precautions surrounded the
activities of OCI, and as a practical matter it was
not possible to make effective use of the sub-
stantial body of cartographic expertise in the
Geography Division of ORR. The same security
precautions led to the need for providing several
"in-house" graphics facilities and were largely

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responsible for the unorthodox division of labor
that characterized cartographic support to current
intelligence for many years (see Figure 2).

The Cartographic Branch of ORR's Geography
Division was unique in government in the manner in
which it employed professional geographers to
produce special-subject maps. Its know-how
emanated from experience gained over almost 10
years of working together as a team, first in the
Office of Strategic Services, then in the Department
of State, and after 29 December 1947 in CIA. It,
too, had been part of ORE but had become a part of
the Geography Division of ORR as a result of a
recommendation to that effect in the Dulles Com-
mittee report. However, it had always been
physically separated from the mainstream of Agency
activity and was perhaps in that era temperamen-
tally and spiritually unprepared to cope with the
special time constraints imposed by current
intelligence.

OCI, on the other hand, had a group of [   ] .   (b)(3)

artist-illustrators ("[   ]'s Shop") in the   (b)(3)
                                                               (b)(6)

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Technical Branch of its Situation Room Division.
This group formerly had been one-half of a larger
unit which had operated under various names since
CIG days, always working closely with the Director
and his staff on briefing aids, and it was the
only graphics shop in the Agency cleared to handle
COMINT material. Its charter assigned it specific
responsibility to

> present in graphic form the all-source
> intelligence available in all fields in
> support of substantive intelligence meetings
> [and] provide all graphics work for permanent
> Situation Room displays, as well as maps and
> charts for all OCI publications. 5/

For these reasons, it was the unit which produced
the first CIB and CIR maps, even though its roster
contained no cartographers.

The other half of the divided graphics unit
was also composed of [   ] artist-illustrators.   (b)(3)
This group, known colloquially as "[   ]'s   (b)(3)
Shop", had functioned as the Graphics Branch of   (b)(6)
ORE for a short while after the split occurred.
The dissolution of ORE left this little unit with-
out a home in the managerial area that was to
become the Directorate of Intelligence. It was at

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first slated to become a part of ORR's Publication
Staff, but ORR management decreed that a more
logical place for it would be the Cartographic
Branch. Steps were being taken in early 1951 to
move it there. 6/

The Special Center, therefore, lacked any
readily available cartographic expertise, even
though OCI, the Office of Scientific Intelligence
(OSI), and the Strategic Division (D/Z) of ORR
were all located there by 1951. Mr. [   ]
[   ], a GS-11 cartographer with OSS experience,
was tasked by the Chief of the Geography Division
to set up a production unit in the Special Center
in "Q" Building and perform such liaison functions
and advisory services within the Center as he was
able. It perhaps was not a coincidence that the
request for a special intelligence clearance for
Mr. [   ] was initiated on the exact date (2
August 1951) OCI published the first Current
Intelligence Review, presaging the stress on maps
that was going to come about a few years later.
By October Mr. [   ] had been joined by [   ]

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other assignees from the Cartography Branch, [   ]

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(b)(6)

_____. The

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unit was soon formalized as the Cartographic

Support Section of the Cartography Branch. Some

knowledge of the parent branch is necessary to

understand the nature of subsequent events.

The Cartography Branch was comprised of

about [   ] people, including "compilers" (professional

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geographers trained in cartographic research) and

"draftsmen" (cartographic technicians who turned

the manuscript into a form suitable for printing).

The Branch was self-contained in many respects. It

had been housed since 1950 in a small temporary

building (Building 11) several hundred yards east

of Tempo "Q" near Constitution Avenue and 23rd

Street, N.W. The building had been renovated to

meet Cartographic Branch requirements, and in

recognition of the drastic manner in which heat

and humidity changed sizes and shapes of drawing

materials, it was at the time one of the few

government buildings to be completely air-

conditioned from a central system. The Branch had

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(b)(3)

(b)(3)

its own file room, its own printshop for making
type and symbols, and its own laboratory for
research into the technical aspects of making
better maps. It also conducted its own training
course for new employees and in large measure
conducted its own recruitment program. Organi-
zationally, the Branch consisted of six sections:
three compilation sections, a drafting section,
and the recently acquired Graphics Section in
addition to the Cartographic Support Section.
Relationships among the sections varied. The three
compilation sections and the drafting section
worked closely together. The Cartographic Support
Section interacted regularly with both compilation
and drafting because of its liaison function and
because of the lingering associations between its
members and their former colleagues in those
sections. The interaction among these five units
was of extreme importance in the unfolding of
organizational movements which took place during
the next two decades because a high degree of
stability within the organization was retained,

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thus enhancing its ability to cope with changing
conditions in other parts of the Agency.

The Cartographic Support Section spent the
first few months of its existence establishing a
presence in the Special Center (the codeword area
of "Q" Building and other buildings as it expanded).
Acquiring the first items of furniture was a
matter of "scrounging." The unit operated as a
team from the very beginning, with each person
carrying on regular duties but pitching in in times
of crisis to do whatever he was equipped to do.
Many formal procedures followed in the parent
branch proved to be unnecessary in the smaller
unit, and the easy informality which arose there
became a valued tradition.

At that time the Strategic Division (D/Z)
was the only ORR component within the Center. It
was for them that the first map produced by the
new section was done:

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(b)(3)

All the data added, including all   (b)(3)
type, was hand done. The second map was also an

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overprint to a base. The third map produced was

in fact the first map requested. 8/   It was

prepared for an economic study

(b)(1)
(b)(3)

(b)(3)
(b)(1)

It, too, was an

overprint to an existing base. The black plate

(b)(3)
(b)(1)

was out of register by 1/10" and the green plate

by 1/20". The type was prepared by an ingenious

("perditious," according to ⬚) device

(b)(3)
(b)(6)

called an imprinter which employed letters placed

into a roller and rolled across the face of the

map to imprint the words in the correct location.

These maps were remarkable achievements

considering the conditions under which they were

done, but their crudeness was unacceptable to the

cartographer. It was soon decided to overcome the

security problem by scrambling type orders and

having the type prepared in Building 11. Printing

quality was another matter, however, because

facilities within the Center were very limited.

The small printing plant in Tempo "Q" was inde-

pendent of the main printing facility in South

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(b)(3)

Building. It was originally set up to service the General Division of ORE and had made a paper transfer to the Office of National Estimates (ONE) for a short time before ending up in OCI. It would not be made a part of the Printing and Reproduction Division until late 1952. The [   ] staff operating the multilith equipment (b)(3) did the black text and red classifications simultaneously. 9/ They had also learned to overprint small base maps procured in quantity from the Geographic Division with story overlay plates prepared on multilith masters by an artist or cartographer using a pencil. Maps too large or too complex for this technique were carried to the main plant and printed overnight by specially cleared personnel. 10/ These are only a few examples of the many improvisations, made one after the other, that make up the story of graphics activities throughout the early years in the Special Center. They were essential because stringent security precautions put established facilities and procedures out of reach.

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III.   Shakedown, 1952-1953

A.   Map Production

The Cartographic Support Section provided
their first CIB map 11/ on 18 January 1952, using
an overprinting technique.   It was to make this
CIB item more meaningful:

Comment on new travel
restrictions in the USSR:

The Soviet Government has enlarged the
restricted travel area for foreign diplomats
to include key localities in the vicinity of
Moscow as well as twenty-two cities in
European Russia and Siberia.   This action
has the effect of further limiting foreign
knowledge of defensive installations sur-
rounding Moscow.   Five of the cities are
located on the Trans-Siberian railroad west
of Lake Baikal.   With these additions to
previous restrictions, all possibility of
observing this main artery for the supply of
war materials and industrial goods to the
Far East and the Korean front is eliminated.
(See map on following page.)

The overprinting method proved satisfactory,
and a series of several dozen unclassified bases
was put into production in Building 11 to be
available for use in the CIB.   These were generally
known as " ____ maps", after their sponsor, Mr.

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____ of the OCI Situation Room Division.

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(b)(6)

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(b)(3)

The CIB of 21 February 1952 contained the first

production model of this series, depicting ⬚ (b)(1) (b)(3)

⬚ (see Figure 3). The (b)(1) (b)(3)

overlay was prepared in the OCI Technical Branch

using a typewriter for names and a compass to

draw circles. The technique continued to be used

for the next two years until the printing plant

acquired the equipment to print maps from scratch.

The weekly CIR began to contain both maps and

graphics in every issue by early 1953, produced by

both OCI's Technical Branch and Cartography

Division's Special Support Branch.

An examination of Agency publications before

this period reveals surprisingly few instances of

maps being used to depict current intelligence

situations, even in the case of Korea. This is in

such stark contrast to the period some years later

when ⬚ maps a day on Vietnam alone (b)(3)

were commonplace that it gives cause to seek the

reasons. Technical restraints were undoubtedly an

important factor, but there existed means to over-

come that hurdle if a strong enough demand had

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arisen. It seems in retrospect that the disjointed character and jumbled administrative control of the Agency's graphic and cartographic production resources would have hampered any efforts that might have been put forth.

B. The Special Support Branch (GC/X)

, ORR was reorganized in July 1952, and the name of the Cartography Branch was changed to Cartography Division. The Cartographic Support ~~Construction~~ Section became the Special Support Branch (GC/X). It was initially headed by Mr. [   ], who left "X" to return to Building 11 as Chief of the Europe-Africa Branch in November 1952. Miss [   ] took his place.

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(b)(6)

(b)(3)
(b)(6)

GC/X worked very closely with OCI during most of the summer helping to plot intelligence information on large wall maps in the Situation Room. In the monthly report for August 1952 Mr. [   ], the Cartography Division Chief, reported that "the Special Support Branch is well organized and can accept requests with confidence."

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In October it did ☐ maps for a Presidential

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handbook under a short deadline. In November

the entire Division did a series of maps, co-

ordinated by OCI, for the use of President-elect

Eisenhower. ·

C. Lack of Administrative Unity

The lack of administrative unity in graphic

matters was readily apparent within the Special

Center. GC/X of ORR provided cartographic support

to OCI; it also provided maps and graphics to OSI

and ☐ of ORR. The Technical Branch of

(b)(3)

OCI prepared maps and graphics for publications,

maintained the Situation Room displays, and pro-

vided visual aids for the DCI and other high-level

Agency officials. 12/ There was a clear (or

rather, unclear) area of overlap between the two

units.

Outside the Special Center, the Cartography

Division was not only fulfilling its unique

responsibility to produce maps requiring carto-

graphic research but also had under its wing a

Graphic Branch which in many respects overlapped

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(b)(3)

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and even competed with OCI's Technical Branch.

This unit ("_____'s Shop," see section B of   (b)(3)
                                                                         (b)(6)
Chapter II, above) had been grafted onto the old

Cartographic Branch as the Graphics Section in

February 1951. It is essential to understand the

shotgun-marriage nature of this union in order to

understand two subsequent mergers in 1954 and

1965. A substantially accurate account of it was

compiled for an earlier history.

> For some time in the Agency there was a
> group called the Graphics Branch which had
> been shifted from one office to another
> ....Because they worked for the Agency as a
> whole and they did not fit in logically with
> any special group, no one wanted to join
> with them just for administrative purposes.
> Periodically, the Geographic Division had
> been approached regarding possible placement
> of the Graphics Section within its organi-
> zation. However, they always expressed
> unwillingness to such a transfer because a
> 'large part of the Graphics Section's work
> was neither cartographic nor geographic in
> character.' In a memo to Millikan, AD/RR,
> on January 18, 1951, the Advisor for
> Management apparently suggested, possibly
> as a final resort, that they should put the
> group in the Publications Branch, ORR. (The
> Advisor for Management wanted the group in
> ORR, but the main discussion was where, in
> ORR.) Before this change could be effected,
> the D/G finally yielded because 'it has
> become increasingly evident however, that
> certain advantages to CIA would accrue from

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a transfer of this section to the Cartography
Branch, D/G...also understood that your Staff
is desirous of recommending such action.'
Furthermore, it was to be agreed that D/G
would have the same 'substantive control
over graphics and art work performed for all
requesters that it now has over cartographic
production.' Thereupon, the AD/RR suggested
to the Advisor for Management that the group
be transferred to the Cartography Branch
rather than to the Publications Branch as
stated in the previous memo. The reasons
given were that the work of the Section is
'basically dissimilar' to the Publications
Branch, and direction should rest on a
branch with similar functions. 13/

On 27 February 1951 the Geographic Division
officially "took in" the Graphics Branch admin-
istratively. This could not be called a proper
"merger," because although there was now one unit
where formerly there had been two, each continued
to do its own work.

The lack of a coordinated effort between
ORR's Graphics Section (nee Graphics Branch) and
OCI's Technical Branch, both performing the same
kind of work, troubled the Chief of the Cartog-
raphy Branch, Mr. _____ , who mentioned
in the Branch's monthly report 14/ the need for a
solution to the "total graphics picture" and for
several months running stressed the need for a

(b)(3)
(b)(6)

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(b)(3)

(b)(3)

survey of the graphics facilities in the Agency.
Such a survey took place in late 1952. Covering
10 separate graphics facilities in the Agency, the
survey report noted that "The Deputy Director
(Intelligence) has requested additional graphics
within OCI publications that exceed [OCI's] capa-
bilities." It went on to recommend consolidation
of the units which lent themselves to it under the
"ORR Cartography Division of the Agency," since
it was believed that the "Graphics Branch of ORR
more closely approximates that of a central serv-
ice than any other facility." 15/ Management did
not accept this recommendation, apparently leaning
more toward the findings of a similar survey in
1950 which concluded that "centralization of
graphic facilities would in no way assist offices
affected," although "one building housing all CIA
activities would lend itself to [such] consolidation."
It would be another year before serious attempts
toward resolving the "graphics problem" would
begin anew.

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(b)(3)

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IV. The Eisenhower Years, 1953-1960

A. Graphics for the New President

President Eisenhower had been made acquainted
with the CIA during the 1952 election campaign.
President Truman had ordered that both candidates
be given periodic briefings, and the Cartography
Division had prepared some of the base maps that
were used by OCI Technical Branch in making the
presentation material.

With the change in administration, a
grandiose scheme was undertaken at OCI's request
to prepare for the White House a series of maps
of the regions of the world on hand-painted
panels, using enamel paint, which would be
instantly available for briefing purposes. 16/
The project required a maximum coordinated effort
from both OCI Technical Branch and ORR Cartography
Division which sadly turned out to be largely
wasted because the White House decided the maps
were too cumbersome to be usable. Abortive
efforts of this kind subsequently proved to be

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common with every changeover in administrations,
but they illustrate the intense desire on the part
of Agency people to provide a new president with
useful information. Uncertainty reigns at the
early stages of an administration about both the
substance of the needed intelligence and the form
it should take.

Eisenhower was known to prefer oral
briefings over having to read reports. Both DCI
Smith and DCI Dulles made frequent trips to the
White House for these oral briefings, carrying
large briefing panels made by either the OCI
Technical Branch or the Graphics Branch in the
Cartography Division. The President had
additional contact with the Agency through both
the CIB and the National Security Council. 17/
Presidential assistant Sherman Adams related

> Ready for him (the President) when he
> arrived [in his office each morning] were
> the latest State Department, CIA and
> military intelligence reports and the
> staff secretary, at first General Carroll
> and later General Goodpaster, would be on
> hand to give him the essentials in all the
> various intelligence information [see
> Figure 4]. Once a week the White House
> staff was briefed by the CIA and at the

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weekly National Security Council meetings
the President listened to another summary
of top-secret world developments by Allen
Dulles, the CIA head. 18/

A quickening interest in maps and graphics
was quite evident during Eisenhower's administration.
The considerable concern over the Nationalist China-
Communist China problem caused large numbers of
maps to be prepared on the Taiwan Straits and the
offshore islands. Berlin and the Middle East area
underwent recurring crises. It appeared to members
of "X" Branch that a conspiracy was afoot to keep
at least one hotspot going all the time, to which
they had to respond with overtime.

B. Jurisdictional Disputes and OCI Graphics

It became increasingly evident in 1954 that (b)(3)
the OCI Technical Branch headed by Mr. _____ (b)(6)
_____ and the Cartography Division Graphic Branch (b)(3)
(b)(6)
headed by Mr. _____ were engaged in un-
healthy competition. Moreover, the Graphic Branch (b)(3)
(b)(6)
never did fit in very well with the rest of the
Cartography Division, which it had joined by
default. The artists and the cartographers got

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(b)(3)

along very well socially and as individuals, but it was clearly evident to everyone that they marched to different drumbeats professionally. Finally, in August 1954, the Chief of the Cartography Division met on several occasions with members of the DDI's Office and the Situation Room Division of OCI, 19/ and by November an agreement had been reached for the transfer of the Graphic Branch to OCI. Mr. [   ] expressed high praise   (b)(3)
                                                                         (b)(6)
for the departing unit and its chief and commended their contributions to the support of the Division. He noted that the Branch had shown marked improvement over the past several years, and he believed that it would contribute greatly toward the creation of an effective DDI graphics unit.

The official notice of the change was issued on 4 January 1955. It read as follows:

> 1. The Technical Branch, OCI and Graphics Branch, ORR, have been consolidated into the Graphics Branch, Presentations Division, with offices in Room [   ]   (b)(3)
>
> 2. The mission of the new branch includes analysis and production of graphics for all the DDI offices, but excludes cartography, which will continue in ORR.

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(b)(3)

3. Mr. [   ] has been designated   (b)(3)
Chief of the new Graphics Branch. 20/   (b)(6)

The new Graphics Branch came immediately to

be known as "OCI Graphics." Soon after its

official establishment, which was more than two

months after the fact, a new version of the

Current Intelligence Weekly Review went into

production. In a foreword to his new publication,

Mr. Huntington D. Sheldon, Assistant Director for

Current Intelligence, described it as being

> the first number of a new weekly Code Word
> publication of the Office of Current Intel-
> ligence which replaces the Current Intelli-
> gence Review, the Situation Summary and
> Critical Situations. 21/

It was to consist of four parts: a summary; "Of

Immediate Interest"; "Notes and Comments," dealing

with less urgent situations; and an analysis of

long-term trends.

Graphics and maps were going to be

increasingly important for the new Weekly, but new

jurisdictional disputes between Cartography

Division and OCI Graphics were in the making. In

the third issue of the new Weekly, [ ] maps and a   (b)(1)

chart appeared, all prepared by OCI Graphics.

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(b)(3)

Professional sensibilities in the Cartography

Division were pricked by what they regarded as

poor map work. The matter was discussed at the

Branch level and thought to be resolved several

months later when Miss [   ] reported that   (b)(3)
(b)(6)

> when we take over map work for the Weekly
> we will handle all liaison with editors and
> staff of the Weekly instead of going through
> O/CI Graphics. 22/

A shock was in store, because the "take over" of

Weekly map production was not to be an accomplished

fact for some time to come. In two separate

notices, OCI addressed the issue without clarifying

the hazy areas of responsibility. For example, on

13 June 1955 OCI announced:

> Effective this date, the Chief,
> Presentations Division, in carrying out his
> responsibilities for the production of
> illustrations (graphic and cartographic) for
> O/CI publications, may call on either Graphics
> Branch, Presentations Division, O/CI, or the
> Special Support Branch, Cartography Division,
> O/RR, as appropriate. 23/

The jurisdictional confusion still existed

in August. [   ] wrote that "the lack of clear-   (b)(3)
(b)(6)

cut directives is the primary cause of the

problem." 24/ A second OCI notice in September

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(b)(3)

(b)(3)

concerned the overall problem but failed to address

the issue that was of interest to the principals.

1. **Purpose** These standing procedures
are issued to prevent publication of in-
adequately conceived and executed graphics
in illustration of articles published by O/CI
in its Current Intelligence Weekly Review
(CIWR) and Current Intelligence Weekly
Summary (CIWS).

2. **Scope** This regulation applies to
O/CI. A copy has been transmitted to AD's
of other offices contributing illustrated
articles to the CIWR and CIWS, with request
for their issue of similar instructions
within their offices.

3. **Responsibility** [Describes respon-
sibility of author-analyst for correctness
of data and for making sure the graphic is
in accord with the concept originally
approved by the O/CI Publications Board.]

4. **Procedure** [Describes the channels
for requesting a graphic and includes a
sample request form.] 25/

The first step in the procedure described in

paragraph 4 of the regulation required the analyst

to obtain the approval of the Chief of the

Presentations Division of OCI for his graphic.

The Presentations Division therefore retained

de facto authority to segment responsibilities as

the Chief saw fit. By December Mr. [   ] was   (b)(3)
(b)(6)

able to write in the monthly report that

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(b)(3)

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(b)(3)

A meeting with the Chief of the Presentations Division resulted in a clearer understanding of relationship between Graphics Branch and GC/X. 26 /

In a lengthy memo entitled "O/RR Cartographic Division Views on Responsibility for Artwork in CIWR," describing the same meeting, the Chief of the Presentations Division presented the OCI view as well. Essentially, he said that Mr. [   ] (b)(3) (b)(6) was bringing up his concern over a breach in the understanding that OCI Graphics' field of endeavor did not include doing maps or "statistical charts," which lay within the purview of Cartographic Division..

> Mr. [   ] has received the impression (b)(3) that the consolidated D/Pres Graphics Branch (b)(6) would, in essence, confine its future work to the production of large-size illustrations required by various DDI components. All other artwork was envisioned as the proper responsibility of O/RR's Cartographic Division (and Miss [   ]'s Special Branch (b)(3) in particular). 27/ (b)(6)

He went on to say that the pressures of deadlines made it mandatory for short-deadline work to be done in OCI Graphics, whether maps or non-maps, and that efforts being made to achieve greater

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(b)(3)

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(b)(3)

leadtimes were not particularly fruitful. He

criticized a recent illustration planned and

executed by the '_____group".

(b)(3)
(b)(6)

> The conception was excellent, but an
> otherwise impressive treatment was reduced
> in its impact by a 'style' that remained
> fussily cartographic, rather than bold and
> simple.... 28/

He concluded,

> there is no question but that Mr._____
> feels most strongly that the Agency's
> interests will best be served if most
> conventional CIWR maps are for the most part
> produced by his Division.... 29/

(b)(3)
(b)(6)

He stated that, as a matter of policy, OCI would

give Miss_____ "first refusal" on all con-

(b)(3)
(b)(6)

ventional maps for the CIWR OCI appeared

determined to avoid relinquishing any of its

prerogatives.

In April Mr._____reported optimistically

(b)(3)
(b)(6)

that during the past six weeks GC/X had contrib-

uted essentially all maps required for the OCI

Weekly. He viewed this as an encouraging

development which reflected cooperative efforts of

the Branch and OCI. 30/ However, an examination

of the Weeklies during that period reveals that

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(b)(3)

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(b)(3)

the matter was not in fact resolved for several
more months. During May, [ ] maps in the Weekly
were made by OCI and [ ] by GC/X. In June, [ ] (b)(3)
were made by OCI and [ ] by GC/X. By July all
cartographic work was being done in GC/X, and a
jurisdictional problem that had been in ascendancy
for almost two years was finally resolved.

C. Technical Advances

In the early Eisenhower years, the number of
maps and graphics used in the CIB and the Weekly
grew, but printing plant limitations made these
efforts appear crude. Color work was possible,
though considerable jury rigging was necessary to
get it.

A significant forward step took place in
February 1954 when the printing plant acquired a
Robertson studio camera which made photo-offset
printing possible in the Special Center for the
first time. The first use made of it for a CIB
map was to illustrate the order of battle in
[ ] and the adjacent area of [ ]. (b)(1)
(b)(3)
Terrain hachures showed in green, place names and

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(b)(3)

(b)(3)

(b)(1)
(b)(3)

boundaries (from the plates to a Cartography

Division map) in black, 17 order-of-battle symbols

for enemy forces in red, and three symbols for

[ ] garrisons at [ ], and

[ ] in blue. 31/ It was the forerunner

to many [ ] similar maps produced on   (b)(3)

[ ] over the next 17 years in a constant

attempt to portray the "situation." The map was

a new departure not only in printing technique but

also in that it was cut into the text adjacent to

the section of the story it illustrated and was a

valuable adjunct.

     As soon as the functional separation between

OCI and GC/X became effective, there was a

spectacular upturn in the quality of the graphics

and maps in the Weekly. Under the new arrange-

ment, artists and cartographers -- members of two

different professions -- exclusively did work they

were trained to do, and they collectively became

a part of the team that provided the Weekly

readership with a high-quality publication indeed.

The Weekly was quite voluminous, averaging [ ]   (b)(3)

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(b)(3)

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(b)(3)

pages of text in the beginning and more than [   ] (b)(3)

later on. Map and graphic work was becoming quite

sophisticated (see Figure 5). By the third year

of publication, OCI Graphics was averaging [   ]

charts and GC/X [   ] maps in each issue. The high (b)(3)

quality of this publication reflected the work

of the OCI Publications Board and its Secretariat

who oversaw the Weekly (and the CIB) down to the

smallest detail. Mr. [   ], a staff member (b)(3)
(b)(6)

who coordinated the work of the analysts with the

expertise of the artists and cartographers, was a

strong force behind this achievement. 32/

  For reasons that are not clear, the juris-

dictional problem that arose with respect to the

Weekly did not spill over to the CIB. OCI Graphics

had exclusive responsibility there and ran a "late

shift", originally with approximately one-half of

the work force but later as a [   ] operation,   (b)(3)

which had as one of its purposes the preparation

of graphics for the CIB. Few charts were required,

but a map or two appeared in almost every issue.

GC/X base plates drawn for a previous Weekly map

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(b)(3)

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(b)(3)

were invariably used by the OCI Graphics late-
shift person who prepared the overlay depicting
the particular event that was being reported (see
Figure 6). The artists who worked the late shift
made no claim to being cartographers and in fact
would have considered being called one a
disparagement. Their training placed a premium on
the quality of visual impact. This led to an
occasional cartographic howler, such as the time
a Mercator projection was used to plot the impact
points of four Soviet missiles shot into the
Pacific, landing within a few tens of miles of
each other but on both sides of the meridian that
bounded the base map. The CIB appeared with an
illustration showing two spots on the left-hand
side of a world map and two on the right-hand side,
separated by almost 25,000 miles.

The Current Intelligence Bulletin was re-
placed by the Central Intelligence Bulletin on 14
January 1958. It differed from the former CIB
principally in that it was fully coordinated
within the community. 33/ Taking into account

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(b)(3)

(b)(3)

President Eisenhower's liking for both maps and
brevity, the inside front page of the new CIB
contained a map of the two hemispheres with areas
highlighted where significant events were taking
place, along with one or two short sentences
providing a brief. The front-page map (see Figure
4) proved to be a successful device and was
continued unchanged until President Kennedy set
forth his own distinctly personal requirements.

The story of "X" Branch would be incomplete
without a passing reference to the role it played
in utilizing U-2 photography from the earliest
days. Quite apart from its work on OCI publications,
the Branch undertook the task of using the photo-
graphs to construct maps of Soviet cities about
which there was an almost total lack of first-
hand knowledge since prewar days. It was the
first known attempt to use this new source to
construct large-scale maps. Efforts continued
until the Army Map Service in 1959-60 applied its
vast resources to meeting the requirement for up-
to-date maps of the Soviet Union based on aerial
photography.

(b)(3)

(b)(3)

V. The Kennedy and Early Johnson Administrations, 1961-1965

A. The New Frontier

President Kennedy's voracious appetite for information was not satisfied by the one-page briefs that had been done for President Eisenhower. OCI immediately added to its string a new daily publication specifically tailored to President Kennedy's needs. It was called the "Checklist" and was literally all-source, containing items such as agent's reports and information derived from clandestine photography. 34/ The "Checklist" (later called the President's Daily Brief) contained an occasional map or chart lifted from the CIB, but only rarely was an original map done for it.

The "New Frontier" also brought into the White House offices a number of young intellectuals who concerned themselves with foreign affairs. In the early part of the Kennedy administration, weekly National Security Council briefings by Mr. Allen W. Dulles, DCI, were still carried on. According to the usual routine, OCI Graphics

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(b)(3)

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prepared visual aids for these, and one of the
younger artists was detailed to escort the boards
down to the White House in a station wagon, set
them up in the cabinet room, and stand by outside
until the meeting was over so that he could take
them back to Headquarters. During the transition
period in early 1961, Mr. Dulles walked into an
NSC meeting a few minutes early and saw Mr.

of OCI Graphics standing beside the   (b)(3)
                                           (b)(6)
briefing boards. He presumed he was another one
of the youthful representatives of the New
Frontier come to learn the state of the world. He
put out his hand and boomed, "Dulles, CIA." Mr.

replied, "Yes, sir, I know. I work for you." (b)(3)
                                              (b)(6)

B. Move to Headquarters Building

Almost coincidental with the beginning of
the Kennedy administration was the Agency's move.
to its new building. GC/X moved concurrently
with OCI in the fall of 1961, occupying Room   (b)(3)
in the Special Center. These were ordinary
quarters, but they were equipped with a number of
accouterments which improved efficiency. There

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were special light fixtures for added illumination, a photolab for in-house duplication of master plates, and a spacious vault for storage.

Several new materials and pieces of equipment had been uncovered by the Division's Technical and Construction Branch which enabled GC/X to become largely self-sufficient in the preparation of type and certain intermediate materials required in a cartographic production shop. 35/ It was becoming more and more a miniature version of the entire Cartography Division, operating autonomously in many respects.

OCI Graphics was very kindly treated with rooms on the _____ floor having an array of   (b)(3)
floor-to-ceiling windows looking across the Virginia woods into Maryland. It was also con-veniently located between the OCI editorial offices and the printing plant which was provided with excellent facilities. It could handle every need of both the artists and the cartographers. Just prior to the move, Mr. _____ once again took over the direction of GC/X. Miss _____   (b)(3)
(b)(6)

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(b)(3)

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(b)(3)

had resigned from the Agency in 1960, and Mr.

_____ had acted as Branch Chief during   (b)(3)
                                                  (b)(6)
the period, June 1960-August 1961.

C. The Crisis, USSR/Cuba

GC/X was closely involved in providing
intelligence support during the Cuban missile
crisis in 1962. U-2 photography flown on Sunday,
14 October, showed surface-to-surface missile
sites under construction southwest of Havana.
During the day on Monday, an urgent request came
into "X" Branch from OCI to make a map showing
distances from the sites to the United States. A
manuscript map was hastily prepared and handed
over. At the same time, in another part of the
Division, a query had come in from ORR asking for
the exact distance between pairs of coordinates
in Cuba and Washington, D.C. The range of the
missiles and the distances of the sites from
Washington and other major cities were of most
intense interest during the first few hours after
detection. Some analysts learned for the first

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(b)(3)

(b)(3)

time that determining distances along earth arcs
is a great deal more complicated than measuring
short distances on a school map. Fortunately,
several individuals in the Division were trained
to cope with this kind of problem, and accurate
determinations were quickly made. Washington lay
at the outer edge of estimated range capabilities
of the type of missile first detected.

   On Tuesday, 16 October, Mr. [   ]   (b)(3)
[   ] made a map from scratch which showed distance   (b)(6)
relationships between the missile sites and the
United States. 36/ It accompanied a three-page
typescript OCI memo, 37/ believed to be the first
authoritative information disseminated on the
probable Soviet MRBM sites in Cuba, though pre-
liminary judgments had gone to the Secretary of
State late Monday night 38/ and to the President
at 9:00 a.m. on the 16th. 39/

   During the following ten days, GC/X was
fully occupied with Cuba. Almost half the projects
officially logged in between 16 and 26 October
dealt with it in one way or another, and considerable

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(b)(3)

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(b)(3)

unlogged support was provided to the Situation
Room and to "walk-ins" who needed immediate
cartographic support. The 16 October map had to
be extended three days later when longer range
missiles were detected. After President Kennedy
invoked a quarantine on foreign shipping on 22
October, emphasis shifted from the sites themselves
to the Soviet ships steaming toward the island.

The formal daily situation report called
"The Crisis, USSR/Cuba," prepared for the Executive
Committee of the National Security Council begin-
ning on 24 October, contained surprisingly few
maps. 40/ Only two basic maps were used: one was
a CIB-type map of the island and the missile
complexes done by OCI Graphics; the other was a
reiterative map of the North Atlantic showing the
progress of Soviet ships as they moved toward the
Caribbean. 41/ One of the ironies of the time was
the printing on 18 October for the SECRET-level
Current Intelligence Weekly Summary of a Cuba map

(b)(1)
(b)(3)

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(b)(3)

(b)(3)

Branch activity returned to the normal routine after the lifting of the quarantine on 27 October. The final brush with the Cuban crisis occurred a month later. A fairly sophisticated map, twice as large as page-size, was done to accompany a memo for President Kennedy laying out in detail the time sequence of construction activity. 42/ In an attached note addressed to Mr. McGeorge Bundy, the Special Assistant to the President for National Security Affairs, Mr. Cline, the DD/I, noted that it was to be used for "Mr. Mikoyan's visit to the President tomorrow" (28 November). 43/

The Cuban missile crisis illustrated, among other things, the frequently demonstrated fact that being "in the know" about important current events gives people in the current intelligence end of things a tremendous psychological boost, even though the demands upon their personal lives are arduous at times. The Cuban crisis was kept under the tightest security wraps for the first seven days. The President's 22 October speech,

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(b)(3)

(b)(3)

bringing the matter into the open, provided a

great measure of relief to persons privy to the

Soviet activities. The Secretary of State said

afterward in a television interview that

> Senior Officers did their own typing; some
> of my own basic papers were done in my own
> handwriting in order to limit the possi-
> bility of further spread of the utterly
> vital matters we were dealing with. 44/

D. New Tasks for Cartographic Support

During the early 1950's, a high proportion

of GC/X efforts had been devoted to doing maps and

graphics for basic ORR and OSI studies of special

classifications. The association with OSI was so

close in the mid-1950's that some consideration

was given to setting up a support unit in Barton

Hall when OSI moved there from Tempo "M". 45/ ORR

requirements had increased considerably after _____ (b)(3)

Division was dissolved in 1953 and the entire

Office was housed in the Special Center. The

support required for OSI zoomed in 1962 following

Mr. Albert D. Wheelon's assumption of the post of

Assistant Director, and it rose for the entire

DDS&T Directorate when he became the Deputy

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(b)(3)

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(b)(3)

Director for Science and Technology in August 1963.
Mr. Wheelon relied extensively on graphics for his
own presentations and liked to see them in DDS&T
publications (see Figure 7). He created a small
graphics shop as part of his own staff (and
incidentally recruited [   ] of Cartography Division's   (b)(3)
most promising young cartographers to man it).
The total graphics load was so great, however,
that the workload in GC/X became heavily balanced
on the side of non-current intelligence. It was
necessary for Branch strength to be increased
gradually from [   ] persons in 1961 to [   ]   (b)(3)
persons in 1965 to cope with the overall workload.

By early 1964, Vietnam had become such a
preoccupation of the White House that several
specialized publications were created to deal with
the subject. GC/X provided an occasional map for
the "Weekly Report of the Intelligence and
Reporting Subcommittee of the Interagency Vietnam
Coordinating Committee," issued by the Agency
beginning 28 February 1964. Distribution was
tightly controlled in the beginning, copies going

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(b)(3)

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only to Mr. McGeorge Bundy and other members of
the Committee. The maps in it were not particu-
larly revealing, being used principally to
locate "critical provinces" for the reader and to
pinpoint military activity. A year later, on 9
February 1965, a daily Vietnam Situation Report
came into being, with wider -- though still
restricted -- distribution. The new daily was
begun in connection with renewed US air strikes
against North Vietnam. It contained only an
occasional map during its first several months,
and those were prepared by OCI Graphics over GC/X
base plates. Later on, a locator map became
routine, and every issue contained two maps: the
so-called "Boundary Map" (named for its original
title, "Administrative Boundaries") and the
"Strike Map" showing air activity. Both maps were
completely lacking in merit (see Figure 8) as
examples of either graphics or cartography but
were continued unchanged for several months, even
after the responsibility for preparing them was
taken on by the cartographers after the 1965

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(b)(3)

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(b)(3)

merger (see below). Their production was regarded
as a necessary evil by all concerned, and they
were given as short shrift as human nature could
devise.

E. Consolidation

The Geographic Research Area of ORR was
consolidated with the old Office of Basic Intel-
ligence on 1 July 1965 to form a new Office of
Basic Intelligence (OBI). The chain of command
in the new Office was:

Director: 'James A. Brammell
Deputy Director: (b)(3)
Executive Director: (b)(6)
Chief, Cartography Division:

Deputy Chief, Cartography Division

Chief, All-Source Branch:
Deputy Chief, All-Source Branch:
                                          (b)(3)
                                          (b)(6)

A series of personnel shifts were made, in-
cluding the assumption of the duties of Chief of
the All-Source Branch by Mr.   (b)(3)
                                            (b)(6)
Current intelligence was a new milieu for Mr.
whose previous assignment was Chief of the   (b)(3)
Branch in the Cartography Division.

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(b)(3)

Even as the new Office was being formed, steps were underway to merge OCI Graphics and the All-Source Branch (now called "CD/X") of Cartography Division. Mr. Paul A. Borel, the Assistant Deputy Director for Intelligence, had undertaken intensive studies of the organization and operation of a number of DDI components on behalf of Mr. Ray S. Cline, the DD/I, and several major managerial changes resulted from these studies.

Mr. Borel's perusal of Agency publications convinced him that text and graphics needed to be integrated more closely and that the work being done by the two graphics organizations was so similar in character as to make a merger mandatory. 46/ After personally conducting a survey in early July 1965, he summarized his findings on the first point as follows:

> 2. As I see it, the DDI has, through its publications and informal memoranda, repeatedly demonstrated high competence to communicate through the written word. We have also shown considerable ability to communicate through the graphic arts (photography, cartography, artistic illustrations and renderings). We have done less well in imaginatively relating text and graphics in

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(b)(3)

combinations wherein each supports the other with optimal results. The problem therefore is to explore what steps may be taken to upgrade our present effort.

3. Improvement in the use of graphics can, it seems to me, come about in a number of ways.

.a. The amount of graphics can be varied to advantage, some being used, for example, where none has been. This is most likely to be the case where graphics are used to supplement text.

b. The quality of graphics now used can be improved to make for a more meaningful presentation; that is, to tell its story more quickly or more accurately.

c. More importantly, there no doubt are ways of using graphics or graphic techniques as a superior way of communicating ideas now conveyed verbally. This would involve graphics as a substitute for text. 47/

Mr. Borel further indicated that there were

administrative and organizational problems ranging

from

aspects of personnel management, competition for limited resources, allocation of priorities in view of appetites for service beyond means to satisfy, technical problems in the use of color vs. completion of projects with short deadlines, and the host of other matters involving the selection among options each having different impact upon PSD/DDS. 48/

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As a next step, Mr. Borel proposed to visit each graphics shop to familiarize himself with its program and problems and to discuss with its leaders their ideas on how best to proceed.

It was in fact true that, so far as DDI publications were concerned, no discernible difference existed in the kinds of requirements being placed upon the two graphics units. Nevertheless, OCI's two mainline publications presented a particularly muddled situation. Since 1956 it had been established practice that for the Weekly, maps were done in GC/X and non-map graphics in OCI Graphics. For the CIB, both maps and non-maps were done in OCI. The increasingly frequent maps in the CIB were often comprised of a mixture of a Cartography Division base map and an overlay made in OCI Graphics. CIB's for July 1965 contained two basic maps of North and South Vietnam, [   ] [   ] and a scattering of [   ] other base maps used [   ] times each. To an observer such as Mr. Borel, the evidence as to who was doing what graphics in the various DDI and DDS&T

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publications was difficult to discover, and the division of responsibility appeared quite illogical. For example, GC/X did maps for the OCI Weekly and OCI Memos, but not for the CIB. OCI Graphics did illustrations for the Weekly and for OCI Memos, but not for the rest of the DDI or the DDS&T. Cartography Division, GC/X in particular, did all DDS&T work, both maps and non-maps. A not un-common spectacle at the time was a cartographer, holding a Master's Degree in geography without any formal training in design, laboring over a set of simple drawings for a DDS&T publication while an illustrator, holding a degree in art and skilled in design and layout, was doing a patchwork job on a map for the CIB.

On 19 July Mr. James A. Brammell, the Director of Basic Intelligence, submitted a formal proposal that the Graphic Division, OCI, be trans-ferred to the Cartographic Division, OBI, and assigned to GC/X Branch. His supporting argument ran as follows:

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2. The problem of providing the DDI with
a coordinated graphic-support facility can
best be served by centralizing the function
under a single management. Essentially, all
graphic support (maps, charts, graphs,
briefing aids, etc.) involves the visual
medium. Experts in cartography, in graphic
arts, and in visual aids all employ the same
basic skills and techniques. Coupled with
professional training in geography, a com-
bined unit can provide an 'across-the-board'
total graphic support facility.

3. The effectiveness of the All-Source
Branch, CD/BI, results from the strong
administrative support within the Division
and the close support given that branch by
the other branches in the Division. This
includes the latest technical methods and
the total research-compilation efforts of
the regional branches. By consolidating the
graphics unit in the All-Source Branch, these
support facilities would be automatically
available to the total effort.

4. Single management also would provide
a single contact point for requesting graphic
support. Greater efficiency would be pos-
sible in assigning specific tasks and
priorities, arranging for reproduction,
maintaining files, and reacting to 'crash'
projects.

5. The effectiveness of graphics in
supporting intelligence depends on the
quality of trained personnel, the main-
tenance of skills, the effectiveness of
solid management, the stimulation of
imaginative products, and a 'team' concept
with high morale. A merger would provide
these in a minimum of time. 49/

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Mr. Brammell's suggestion was accepted, as was his target date of 1 September 1965. On that date, a terse DDI notice stated:

    1. Effective 1 September 1965, the Graphics Division, OCI, is transferred to the Cartography Division, OBI, and integrated with the All-Source Branch.

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    2. After that date, all requests formerly made to the Graphics Division, OCI, will be directed to the Chief, All-Source Branch, Cartography Division (Mr. [ ]), Room [ ]

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(b)(6)

(b)(3)

    3. Requests for cartographic support not requiring special classification will continue to be directed to the Chief, Cartography Division (Mr. [ ]), Room [ ]

(b)(3)
(b)(6)

The new unit, continuing under the formal name of All-Source Branch (CD/X), but more often still referred to as "X Branch", was comprised of [ ]. [ ] persons had cartographic backgrounds, and [ ] came from OCI Graphics. The managerial problem was to get the two groups to pull together toward a common goal. To outsiders -- for example, the DDI management -- the products of "X" Branch and OCI Graphics showed sufficient similarity for them to be thought of as coming out of one professional group, but in fact

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the disparate backgrounds of the people in the two

former units did not lend themselves to a perfect

blending. Mr. Brammell admonished the new Branch

Chief, Mr. [____], to avoid restructuring the Branch   (b)(3)
(b)(6)

into sections and to guard against the two former

units continuing as cliques, each going its own

way. However, conditions made it mandatory that

at least an informal breakdown be recognized to

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keep production going and standards high. [____] (b)(3)

[____] teams made up of cartographers/illustrators

were tried with limited success. There was con-

stant disagreement between the senior people in

the Branch, on the one hand, who knew team spirit

was slowly developing, and Division and Office

management, on the other, who harbored the old

fears, over the need to organize the Branch along

lines reflecting the type and volume of work

coming in. This fundamental issue remained a

matter of internal controversy for the next five

years.

For six months CD/X operated out of both

Rooms [____]. Support to the current   (b)(3)

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intelligence publications and work on briefing
materials was carried on in Room [ ], and maps   (b)(3)
and graphics for special projects, memoranda, and
reports were done in Room [ ]. Then the latter   (b)(3)
quarters were expanded, and by early March 1966
consolidation was a fact. CD/X was housed in
Rooms [ ] and [ ] until it moved to the   (b)(3)
[ ] floor in 1970.

F. DCI Raborn's Influence on Graphics

Vice Admiral William F. Raborn, Jr., served
as Director of Central Intelligence from 28 April
1965 to 30 June 1966. With his liking for
flamboyant graphics, he had a considerable
personal impact on the Cartography Division.

Admiral Raborn's initiation into the office
coincided with the Dominican Crisis in April 1965,
when several thousand US Marines were sent into
Santo Domingo to give protection to American
nationals there during a period of violence and
disorder. CD/X produced a large quantity of maps
of the city and the sanitized corridor along which
Americans could move safely. These were provided

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to the Agency task force established to watch the situation and were used for situation reports, memos, and the CIB, most of which were delivered promptly to the new Director.

To acquaint himself with the worldwide situation, Admiral Raborn instituted a series of morning briefings covering a specific area or topic. These were held at 9:00 a.m. daily, as the first item of the Director's staff meeting, and were conducted by Agency area and topical specialists, usually analysts from OCI or ORR. The briefing schedule was set up well in advance to allow the analyst ample time to prepare himself thoroughly and to order supporting graphics. From [ ] to [ ] briefing boards became the order of the day, and the artists in CD/X were swamped with requests entailing considerable work of the kind they most liked to do. Numerous accolades from analysts and periodic compliments from the Director were passed back to CD/X personnel and were excellent morale builders for them.

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Admiral Raborn soon engaged the services of
Mr. [   ], an old associate of his in   (b)(6)
the Polaris program, to give Agency supervisors a
lesson in the proper use of graphics in putting a
message across. On 13 August 1965 the auditorium
was filled to capacity with every Agency officer
of Branch Chief rank on upwards to hear Admiral
Raborn give a short talk on his experience with
effective graphics in the Polaris program and then
to introduce Mr. [   ] who talked for more than   (b)(6)
two hours, using a large quantity of illustrations
to make his points.

The lesson took. Analysts who had previously
avoided the use of maps and charts began to under-
stand their importance in reaching pressed-for-
time policymakers. A measure of the change is
indicated by a comparison of the number of maps in
the CIB in July and in October 1965. In July, (b)(3)
before the lecture, [ ] maps on [ ] different areas
were used. In October, [ ] maps were used, plus
several other graphics. This doubling of effort
was not limited to the CIB but carried across the

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board. The burgeoning production figures of the next 12 months (see Figure 9) stemmed from several causes, but Admiral Raborn's interest in maps and graphics was one of the principal ones. For example, Admiral Raborn wanted an atlas on

in preparation for _____ and paid (b)(1)

(b)(3)

a personal visit to the Division on a Saturday morning to discuss the project with Cartography Division personnel responsible for the production of reference-type maps.

In CD/X, requests went up 28 percent, from

_____, in the first six months of the (b)(3)

existence of the combined unit compared to the previous six months. To keep up with these requirements overtime became a way of life, _____ (b)(3)

hours being recorded between September 1965 and February 1966.

Admiral Raborn again retained the services of Mr. _____ in June 1966 to further the cause of (b)(6)

effective communication through more use of graphics. Dr. Edward W. Proctor, the Acting DD/I, and Mr. _____, Chief of Special Staff, OCI, were (b)(3)

(b)(6)

responsible for the arrangements. Following a

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morning session with Dr. Proctor and Mr. [   ],
Mr. [   ] met in the afternoon with [   ]
supervisors of various map and graphics shops in
the DDI, DDS, and DDS&T. Good intentions not-
withstanding, it was not a profitable undertaking.
Mr. [   ] described the problem as being "100
percent human," incensing the cartographers and
artists. 51/ However, in his 11-page report to
the Assistant DD/I entitled "Expanding the Use-
fullness of CIA Graphics as Instruments of
Communication," he dealt himself out of cartog-
raphy calling it "a highly specialized function
in which I have no experience" and restricted his
remarks to "the charts and graphics and panels
used by both government and business in oral
presentation."

Dr. Proctor forwarded the report to the
Executive Director describing Mr. [   ] as "the
Director's Consultant" and noting that

> although it is supposed to present his
> recommendations based on his review of the
> Agency's activities, the memo outlines
> exactly what he told me before he had his
> discussion with the heads of CIA graphics
> shops and before he had a chance to review

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our publications. Clearly these are his preconceptions; yet, there are some worthwhile recommendations in the memo. This could be of use to whomever may be given the task of reviewing the organization and production of CIA graphics. 52/

There is no corroborating evidence to substantiate the hint that an overall review of Agency graphics facilities was in the offing. Admiral Raborn resigned as DCI on 30 June 1966, and the matter was dropped.

G. India-Pakistan War, 1965

Open conflict between India and Pakistan broke out in early September 1965 in the Jammu-Kashmir area, following a number of violations of the 1949 cease-fire line by both sides. A task force was set up to monitor the situation, with situation reports published several times a day in addition to the CIB item. Admiral Raborn's desire for good graphics was by now common knowledge, and the task force wanted to make full use of situation maps in its reports. The new Branch Chief of the new consolidated Branch immediately felt a kinship with Admiral Raborn's position

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during the Dominican Republic crisis five months earlier when he faced both a brand new job and an on-going international crisis of the first order. An approach toward preparing current situation maps that began to take shape during the few weeks of the India-Pakistan war developed into a fine art in later crises. It is necessary to go back a bit to understand why.

An unrecorded but openly admitted reason behind the merger of the two units was to achieve better maps in the CIB. To the cartographers this meant more accuracy and detail. To senior Agency officials it meant greater clarity and less detail. Criticisms at upper levels which may have been voiced in constructive terms invariably filtered down to the mapmakers as admonitions to remove the "clutter," a term too subjective to justify specific reactions. The cartographers felt that everything they were in the habit of including on the maps (locations of forces, roads, towns, streams) was essential to understanding the story. Still, criticisms about "too much clutter" continued to be heard.

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The cartographers doing the India-Pakistan
maps (Miss [   ] and Mr. [   ]   (b)(3)
                                                          (b)(6)
[   ]) and the Branch Chief finally decided they
would prepare a map that would show the opposing
forces and little else. This effort appeared in
the President's Daily Brief of 17 September, and
it had far-reaching consequences. Quite by
accident, not only was the map devoid of the usual
supporting "basic information", omissions which
were planned, but the Printing Plant had neglected
to print even the terrain plate, which was supposed
to bind the data together visually. Mr. Helms,
then the Deputy Director, ordered the map completely
redone by the next morning. Mr. [   ] was told by   (b)(3)
                                                              (b)(6)
the Senior Intelligence Duty Officer that Mr. Helms
had said in no uncertain terms that the next time
he saw a map like that he was going to get someone
by the ****. [   ] people literally worked all   (b)(3)
night to do a new map which was so successful it
was used almost daily for the remainder of the
crisis. This episode marked a turning point in
CIA current intelligence mapping. It laid the old

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shibboleth of "clutter" to rest, because the new map had more information on it, not less, but the background data were woven into the story better than before. It also proved that senior management was indeed anxious to have high-quality maps in current intelligence publications, that off-the-shelf items were not good enough, and that the days of "short shrift" were past.

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VI. Growing Pains, 1966-1967

A. Searching for Simplicity

On 8 August 1966 the Chief of CD/X was
called into a meeting by Mr. E. Drexel Godfrey,
the Director of Current Intelligence, and found
himself surrounded by several senior OCI people
responsible for the CIB and the Vietnam situation
reports. His memo describing the event gives an
insight into the desire on the part of management
to get "good" graphics and into some of the
obstacles that were rapidly being put behind us.

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> [1] Played twenty questions for an hour
> and 10 minutes with Drex Godfrey, Dick Lehman
> (Deputy Director, OCI), Waldo Dubberstein
> (_____, OCI), _____, (b)(3)
> _____ (panel secretary for the CIB). (b)(6)
> They are desperately anxious to improve CIB
> and SITREP (the daily Vietnam Situation
> Report) graphics. They are sympathetic to
> our real problems, but want to smooth out
> rough spots. Godfrey is going to direct CIB
> panel to ensure that adequate guidance will
> be given on graphic requirements, in place
> of the 'map' or 'chart' now thought sufficient.

> Godfrey wants _____ to function
> as a _____ staff, clearing path for correct
> procedures. I told Godfrey (he agreed) that
> we did not want ____ to be a bearer of messages. (b)(3)
> We must not cut off contact between cartographer (b)(6)
> and analyst.

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Dubberstein has strong personal opinions
about appearances of graphics. I pointed
out to the group that personal tastes varied
considerably, and we had to play percentages. 53/

In effect, Godfrey was solving the problem

posed by the "graphics coordinator," a paper

position which had been created by Mr. R. Jack

Smith, his predecessor as D/OCI, after the transfer

of the OCI graphics shop to OBI. The "graphics

coordinator" position proved to be untenable for

the incumbent, Mr. [   ], in that he had   (b)(3)
                                                        (b)(6)
responsibility to oversee the use of graphics in

OCI publications but with no authority to get

things done. He was generally blamed for anything

that went wrong, and it was clearly in the

interests of everyone to make the analyst and the

cartographer or artist more completely responsible

for the accuracy and timeliness of the map or

graphic. Moreover, the notion was rather widely

held that the job had been created to assuage

several members of OCI on the loss of their own

graphics shop. Godfrey did not rescind the

office notice defining the duties of the graphics

coordinator, but by putting [   ] into the   (b)(3)
                                                         (b)(6)

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picture in the place of a formal "coordinator,"
he was providing a means for the OCI front office
and CD/X to communicate instantly on problems.
This decision lowered some tensions that had
previously existed and hastened the day for
achieving more effective graphic products.

B.   A Unique Cartographic Form

The cartographers in CD/X began working out
various systems of portraying military activity
against a cartographic background that would
enhance the reader's ability to see spatial re-
lationships. High-level interest in Vietnam was
evident from the criticisms -- and praises -- of
maps in the CIB or the Vietnam Situation Report
handed out by the DDI at the DCI's morning meeting.
The problem of achieving high-quality cartographic
backgrounds was solved in 1966 by beginning a series
of maps at varying scales designed for the express
purpose of being overprinted with current intelli-
gence information. The "all-purpose" base map
approach was cast aside.

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The most significant advance in handling the
portrayal of military operations was achieved by
an ingenious method of producing relatively large-
scale (larger than 1:1,000,000) area maps begun in
1966. Three dimensional plastic relief map blanks,
that is, without color overprint, were procured
from the Army Map Service. These were side-lit to
permit the shadows to enhance the terrain detail
and then photographed. The photographs were pieced
together, and the splices disguised with an air-
brush wielded by the Division terrain specialist,
Mr. [   ]. The transportation was   (b)(3)
                                                     (b)(6)
drawn at a very large scale and photographically
reduced by a factor of two to four times to obtain
the correct degree of fineness. "Clutter" was
handled by judicious selection of colors and
screens and judicious omission of the nonrelevant,
such as geographic coordinates and small streams.
These base maps were preprinted, omitting the
plates subject to change, such as the name plate,
and stocked in the [   ]floor printing plant   (b)(3)
for instant use. They were highly successful and
became the envy of DIA mappers. They had just the

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right combination of simplicity, authoritativeness, and timeliness (see Figure 10). Miss [   ] and Mr. [   ], the developers of the map form, worked in close partnership with OCI area specialists and the printing plant to get new maps prepared on areas that appeared to be on the verge of becoming hot, so that a quite sophisticated map might appear in the CIB when the action took place.

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This technique was employed to maximum advantage during the North Vietnamese buildup in the vicinity of Khe Sanh in early 1968. There were indications that enemy forces were beginning to concentrate near the Allied base at Khe Sanh in early January. From then through the height of the assault in mid-March there was great concern for the safety of the troops there. To present information in the most meaningful fashion possible, CD/X prepared [   ] base maps at graduated scales, each focusing upon progressively smaller areas. When enemy pressure reached its height, authoritative maps were available on which small details, such as trenching, could be shown.

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C. A Cartographic Analysis of a Soviet Activity

By virtue of its being the only all-source area in the Division, CD/X was called upon to perform many kinds of cartographic tasks not associated with current intelligence. Among these was a 1966-67 project sponsored by the Foreign Missile and Space Analysis Center (FMSAC), requiring cartographic portrayal of the activities of several _____ (the _____ (b)(1)
(b)(3)
series). Masses of information derived from ELINT were available _____

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(b)(3)

However, so much data could not be assimilated by even the most sophisticated reader. It was decided to analyze all data available _____ as a representative first look. It (b)(1)
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was next decided to plot onto existing base maps the territories _____

(b)(1)
(b)(3)

_____ The projected manpower input to do this was so enormous

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that some means had to be found to reduce it. CD/X turned to the growing but then relatively inexperienced computer staff to seek a way to manipulate the data and turn it into something directly usable by the cartographer. The officers involved, Mr. [   ], CD/X, Miss [   ] (b)(3) (b)(6)
[   ], FMSAC, Mr. [   ] an IBM contract (b)(6) employee, and Mr. [   ], DDS&T, tackled the problem with the gusto of new physicians in an (b)(3) (b)(6) epidemic.

A symbiosis among the professions took place in this project that in many ways helped the entire Division -- perhaps the Agency -- get into the forefront of computer applications to carto-graphic problems. A list containing over [   ] (b)(3) facilities of military significance around the world, stored on magnetic tape, was uncovered at the Pentagon. A selection of about [   ] (b)(3) [   ] was made from it and matched against the areas [   ] (b)(3) [   ] (b)(3)

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[ ] by a machine owned by the Office of Special
Activities. The names of the targets were sorted
by a meticulously planned arrangement and processed
through a third computer program -- developed by
Printing Services Division in connection with the
National Intelligence Survey -- which automati-
cally provided type placement on the final map.
Everything worked as planned, and the results (see
Figure 11) stimulated much favorable comment. The
Director wrote Mr. Brandwein, Director of FMSAC,
a note expressing his interest in the project, 54/
and a group of DDI planners opined later that here
was one instance where computers paid off.

D. The Search for Better Design

The pressure from all sides to improve the
clarity of Division products gave several Branch
Chiefs pause to reconsider training requirements.
Division personnel had always been their own
severest critics on technical matters and geographic
interpretations, but training in the area of design
was lacking. The opportunity for day-to-day
association with several excellent resident artists

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instruction plus considerable homework. The

results were impressive. Mr. [   ] touched a   (b)(3)
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responsive chord in people who had hungered for

more knowledge about this neglected part of their

cartographic education. Their "homework,"

comprising exercises in the use of colors and

shapes, was put on display in the Headquarters

Building in an exhibition sponsored by the Fine

Arts Commission.

E. Miscellaneous Chores

"X" Branch carried on many service-type

activities that went unrecorded in the logbook.

It was a convenient place to go, it had a wide

variety of talents available, and it imposed little

bureaucratic redtape. Some of the jobs that fell

to it were:

> Designing nonroutine Agency covers for
> reports
>
> Doing DDP graphics work, if specially
> classified
>
> Providing reproducible materials to graphics
> shops in the Defense Intelligence Agency
> and other organizations
>
> Providing placecards for the DCI's dining
> room

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> Preparing type for titles to most DDI
> publications
>
> Serving as a source of supply for analysts
> who need materials to make their own
> briefing aids
>
> Preparing special briefing books for high-
> level officials on the eve of foreign
> visitors' trips. (Several done for
> Vice-President Agnew were very favorably
> received.)

Other commissions were somewhat less routine. The Arab-Israeli War in June 1967 led to the practice of making the Chief, CD/X, responsible for providing the Director's Conference Room with suitable maps during times of international crises. Care was exercised in choosing what was to go there, to make sure that it would be useful. The Branch was familiar with the room, having previously been asked by the Deputy Director, Admiral Taylor, to "do something about the map panels on the walls," for which it had then done two handsome raised-relief maps of Africa and Latin America. An easel was set up, and between 1967 and 1970 it usually contained a map of the current crisis area -- such as Nigeria, Laos, Saigon, or Czechoslovakia -- suitably annotated.

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In December 1967, a telephone call came into
the Branch from President Johnson's social
secretary, Mrs. Juanita Roberts. She asked that a
map be prepared for use in a memento booklet of the
President's recent globe-circling trip. With some
imaginative planning, a handsome spread of two
hemispheres was produced by means of the Division's
automatic plotter and data bank. The map 55/ was
appropriately entitled "All the Way with LBJ" and
must have made a hit with the President, because
the two project officers, Mr. [   ] and Mr.
[   ], each received a copy of the map
from him inscribed to them personally, perhaps the
only instance of a president citing a CIA
cartographer.

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The Branch was usually called upon to support
Agency task forces providing a round-the-clock
watch on an international crisis, such as the
Soviet invasion of Czechoslovakia, or on a
presidential trip abroad, such as President
Johnson's attendance at the Punta del Este
Conference. In the case of international crises,

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appropriate maps were obtained from the Map Library
and posted on the walls of the task force quarters
in the Operations Center. Task force members or a
CD/X representative annotated these with the latest
information. Task forces issued situation reports
throughout the day, and CD/X normally provided a
map for at least one of the reports, in addition
to the map going into the CIB. In the case of
presidential trips, most of the work involved
plotting the President's itinerary on the largest
possible scale map and identifying pertinent
facilities, such as hotels where the correspondents
were staying or the local police headquarters. On
some occasions, a second display was prepared for
DDP who maintained their own watch.

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VII. Case Studies, 1968-1970

A. The Production Machinery

Procedures for producing and communicating
were basically stable for the entire life of "X"
Branch. The trend was steadily in the direction
of placing greater responsibility on Branch
personnel and fostering increasingly closer
contacts between the Branch and requesters.

Over the years the Branch had developed a
filing system for originals and negatives and a
cross index of published maps that permitted very
quick turnaround time for spot requests. A map on
almost any country or region in the world could be
on the press within an hour. A new kind of type-
writer produced by the International Business
Machines Corporation called the "Selectric
Composer" purchased in July 1968 proved to be
invaluable for quick preparation of small type.
Two Varitype Corporation "Headliners" were
purchased for large type. [   ] place   (b)(3)
names were preprinted and kept on hand for instant

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(b)(6)

application. Base map production by the rest of the Division was closely monitored and duplicate sets of plates obtained. These and similar efforts provided the Branch with unmatched resources to produce high-quality maps on short notice. The Branch clerk-typists, notably Miss [   ], (b)(3) (b)(6) were the overseers of these support activities.

The printing plant on the [   ] floor, (b)(3) under Mr. [   ], was very responsive to (b)(3) (b)(6) all Branch requirements. Its photographer, Mr. [   ], and [   ] day-shift foremen, Mr. (b)(3) [   ], performed miracles (b)(3) (b)(6) with their limited printing equipment designed for 1961-type requirements but not for the quality (b)(3) taken for granted a few years later. All requests (b)(6) for service were channeled through Mr. [   ] [   ] in OCI. Requests that would have an unusual (b)(3) (b)(6) impact on the printing plant were cleared through Mr. [   ], Chief, Intelligence Information (b)(3) (b)(6) Staff, OCI.

In early 1969, the "X" Branch was organized into three sections -- Map, Publications,

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and Presentations -- each responsive to a
particular kind of requirement. This formalized
an internal structure dating back a year or more.   (b)(3)
(b)(6)

The Map Section, headed by Miss ☐ and
later by Mr ☐, was staffed with   (b)(3)
(b)(6)
☐ professional cartographers who

concentrated on map production and development.   (b)(3)

The Map Section Chief coordinated Branch efforts

toward the Current Intelligence Weekly Review,

including attending the planning meeting held every

Monday at 10:15 a.m. in the OCI Front Office. The

deadline for CIWR graphics into PSD was Thursday

noon, making Thursday morning a particularly busy

time in the Map Section. A member of the Section

remained on duty Thursday evenings to examine

copies of the graphics as they came off the press

to make sure everything was in order. In the

event of error, corrective action was taken on the

spot.

The Map Section also staffed the Branch

duty-officer roster, in recognition of the fact

that the frequent emergency calls invariably

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involved map work. The duty officer came in at
10:30 a.m. and worked until 7:00 p.m. or until his
work was done, Sunday through Thursday. He took
the following Friday off to compensate for the
Sunday. The Map Section was responsible for
evolving map products that addressed the needs of
the Weekly, the CIB, the several DDI offices, and
the peculiar requirements of the USIB Committee on
Imagery Requirements and Exploitation (COMIREX).
Considerable pioneering effort went into employing
the Division's growing electronic data processing
expertise for these purposes (see Figure 12).
Each officer had an assigned geographic area of
responsibility, did most of the maps on his area,
and maintained contact with counterpart area
specialists in the Cartography Division to keep
his geographic base information current.

The Publications Section was responsible for
producing non-map graphics. It was staffed by

Visual-Information Specialists   (b)(3)

(formerly Illustrators General). The Deputy Branch

Chief, Mr. [   ], served as Section Supervisor.   (b)(3)
                                                       (b)(6)

He coordinated all DDS&T, OSR, and ONE graphics

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requirements. Each officer was assigned the
graphics requirements of a particular office. As
an aid to planning, Mr. [   ] periodically   (b)(3)
                                                         (b)(6)
attended the meetings of the OSI Intelligence
Board, chaired by the Director, Dr. Donald
Chamberlain. The Office of Strategic Research (OSR)
graphics requirements reflected an appreciation of
the art of graphic communication held by its
Director, Mr. Bruce Clarke, and the know-how of   (b)(3)
                                                     (b)(6)
the Chief of its Publications Staff, Mr. [   ]
[   ], a veteran of the CIWR. The Branch Chief   (b)(3)
                                                         (b)(6)
attended the weekly OSR production meeting, chaired
by the Director, Mr. Clarke.

The Presentations Section was responsible
for single-copy briefing aids. It was staffed by
[   ] Visual-Information Specialists.   (b)(3)
Their work, and the work of their predecessors, is
the subject of a separate OBGI historical   (b)(3)
                                                        (b)(6)
monograph by the Section Chief, Mr. [   ]
[   ].   (b)(3)
                                                        (b)(6)
The total size of CD/X after 1965 varied
between [   ] persons, including the Branch   (b)(3)

(b)(3)

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                                              (b)(3)

Chief, [   ] supervisors, [   ] clerks,   (b)(3)
[   ] artists, and [   ] cartographers.   (b)(3)
Also, one artist was permanently detailed to the   (b)(3)
National Indications Center at the Pentagon.

Division management augmented the strength
of the Branch whenever the work overload reached
an intolerable level. Officers were detailed there
for periods of days or months to work on specific
tasks or just to help out. In general, an attempt
was made to rotate officers who had tired of the
pace and replace them with officers who had not
previously experienced the unique activities of
the Branch. Unfortunately, this policy applied
only to cartographers. There was no reservoir of
artists or illustrators outside the Branch.

B. The Three-layered CIB

When OCI overhauled the CIB in early 1968,
the graphics received close attention. The book
formats were revised to comprise three versions,
with one all-source version prepared specifically
for high-level officials who needed to get the
message clearly and quickly. This new CIB

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provided its readers with succinct, authoritative, and comprehensive summaries of all significant current developments.

Just prior to the launching of the new CIB, CD/X leadership had at last been provided with an instrument to wield on stubborn analysts unrelenting of their traditional prerogatives to control the map. It was in the form of a memo from Mr. _____, Chief of the OCI   (b)(3)
                                                                    (b)(6)
Presentation Staff, directed to all components involved in producing the CIB. In his usual forceful style, Mr. _____ wrote that   (b)(3)
                                                                    (b)(6)

> A careful study of fresh lacerations and older scar tissue indicates that the Director reacts negatively, to put it mildly, to CIB Graphics that are not self-contained and self-explanatory....Do not run a map which is a puzzle until you read the text. Unless the title of the map, or a specific legend, makes it clear why certain areas are colored, don't color them....In other words, the maps should contain what is necessary to help the reader understand the text, but inasmuch as he is going to see the map first don't create a map which interests and puzzles him so much that he bogs down before going on to the text matter. 56/   (b)(3)
                                                                    (b)(6)

As a snapper, the Chief of CD/X or his representative (Mr. _____ or Mr. _____)   (b)(3)
                                                                    (b)(6)

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was now included in the daily CIB planning meeting
where initial decisions were taken with respect
to the thrust of articles and judgments made on
whether meanings would be clarified with the aid
of a map or other graphics. After a month of
experience with the new CIB, launched on 23 April

1968, Mr. _____ was able to write in an internal

(b)(3)
(b)(6)

memo to CD/X personnel that

> Recent comments to me by D/OCI, D/OBGI...
> and numerous requesters clearly indicate
> we are consistently producing interesting,
> useful and attractive products for the
> CIB. 57/ [See Figure 13]

C. The President's Quarterly Report

In late 1969 work commenced on a CIA project
which would pull together into one thin report
"evaluated facts with interpretive comments" on
the subject of Soviet strategic forces. 58/ It
was to be aimed at one consumer, the President of
the United States; to be produced quarterly; to
be all-source without limitation; and to impart
maximum information with minimum verbiage. OSR,
under the leadership of its Director, Mr. Bruce
Clarke, was the principal production agent, and

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representatives from OSR and CD/X worked together
to devise a concept and a layout which would achieve
the desired aims. It was agreed that tight self-
discipline would be exercised on space utilization,
and the graphics would be used freely to convey
ideas of magnitude and change. Opinion was
divided on format, so Mr. [ ] of CD/X (b)(3)
(b)(6)
was tasked to establish a model. He proposed a
folio-size book, one page for each topic, using
maps, photos, sketches, and graphs in harmony with
paragraphs of text. He also presented an
alternative book more conventionally done up. To
everyone's delight, the DD/I, Mr. R. Jack Smith,
favored the folio approach and was seconded by
Mr. Helms and Presidential advisor Henry Kissinger.
After very considerable effort to remain within
the limitation established by the format, success
was achieved. Mr. Helms wrote Mr. Clarke a note
describing the report as "one of the best things
we have ever done." 59/ Its doing required an
enormous expenditure of planning time on the part
of the analysts, the artists, and the printers.

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(b)(3)

(b)(3)

It also represented another example of the fact
that sound planning was the <u>sine qua non</u> of
effective graphics communication.

D. <u>Automated Mapping Applications</u>

     The variety of requirements placed upon CD/X
allowed it many opportunities to experiment with
automatic data processing applications to carto-
graphic problems. These experiments met with
varying degrees of success. Some solutions were
conversation pieces that afforded such design
niceties as bird's-eye views of the earth from
space. Some offered a better basic map projection
than was otherwise obtainable; the first successful
use of the Division data bank was of this nature. <u>60/</u>
Some were spectacularly successful in terms of
man-hours saved or in superior quality achieved.
The latter points became increasingly significant
as COMIREX requirements grew more sophisticated.
Plotting of thousands of targets, earth traces,
range-rings, azimuths, etc., became routine
production problems, limited only by the accuracy
of base maps. Work done in the Branch, primarily

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by Miss [ ] and Mr. [ ] in late   (b)(3)
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1969 and early 1970, demonstrated that an accurate

base 61/ coupled with various computer programs   (b)(3)
(b)(6)
offered vastly improved capabilities to monitor

certain collection programs involving photography.

E.   Vietnam Coverage

The war in Vietnam at first exhilarated, then

exhausted, eventually bored, and always disap-

pointed people closely associated with reporting

about it in CIA publications. CD/X, and OCI

Graphics before it, passed through each stage.

"New boys" were invariably given the job of doing

the routine daily maps. The periods of exhilaration

and creative endeavor were associated with breaks

in the routine. There were a number of these between

1965 and 1970, several of which have received prior

mention in this monograph. The intensity of

interest in Vietnam by the White House was

continually evident. CD/X prepared many [ ]   (b)(3)

of maps and graphics on every phase of the war,

many for ultrasensitive reports. Secretaries of

(b)(3)

(b)(3)

Defense McNamara and Clifford received profusely
illustrated studies from the Agency on the
effectiveness of the bombing campaign. The
National Security Council staff wanted "Eyes Only"
maps done of the trends in the pacification
program. Studies on all phases of the war went
to Presidential advisors Walt Rostow and Henry
Kissinger. One of these projects is worth
describing in some detail because it illustrates
both the problem-oriented character of much of
CD/X activity and Mr. Helms' views on the potential
of a well-thought-out graphic.

In mid-November 1969 the DCI directed the
Special Assistant for Vietnamese Affairs (SAVA)
and the Chief, CD/X, to devise a single-page
graphic that would illuminate trends in the war.
It was to be for the President only and designed
to be delivered to the White House within hours
after the receipt of statistics. Several mockups
were shown to the DCI who made pointed criticisms
about each one, continually stressing the importance
of simplicity and the necessity that trends be

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quickly evident. The final plan contained a
series of small graphs of quantifiable factors
comparing one year with another, combined with
short narrative comments. It was favorably
received at the White House. It has been updated
weekly since the first issue and is routinely
delivered to the White House the same day the
data are received by SAVA.

F. Reorganization and Consolidation, 1970

The increasing complexity of map requirements
at special classification levels developed to a
point that began to give OBGI management rather
grave concern about the effectiveness of the
organizational structure of the Cartography
Division. In 1969 the Division Chief proposed
that the Division be housed either entirely within
or at least contiguous to the Special Center and
that the branches be restructured to overcome
deficiencies that had become more pronounced over
the years. According to his plan, the entire
research activity, for example, should be central-
ized in one large branch; CD/X activities would be

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curtailed, and some of its functions spun off to
the other branches. In a memorandum on the subject
of a proposed reorganization of the Cartography
Division, he described the problem thus:

> The All-Source Branch [CD/X] is isolated
> from the Division physically and extremely
> difficult to manage in all aspects. With an
> increase to ____ people it becomes a major   (b)(3)
> chore to handle time and attendance reporting,
> supervise production, provide policy guidance
> and control, and provide for house-keeping
> chores, supplies and materials. It is quite
> obvious that the Branch responsibilities have
> expanded to the point it has become an entity
> relatively isolated from the other Branches
> of the Division. This has lead to management
> of the Branch making policy decisions which
> rightly belong in the province of the Division
> Chief. There is a duplication of production
> effort between the All-Source Branch and both
> the compilation branches and Technical Support
> Branch. Because of the policy of production
> based on classification there are frequently
> reports issued with graphics produced by both
> CD/X and the downstairs units which leads to
> confusion in the Division and in PSD. 62/

Sufficient space to house the entire Division
within the Center could not be obtained, and it was
decided that appropriate support to current intel-
ligence could be rendered from facilities located
outside the Center. Accordingly, in November 1970,
the old CD/X -- which had been renamed the Current
Intelligence Branch (CD/I) in April 1970 -- moved

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(b)(3)

into quarters on the [   ] floor contiguous with   (b)(3)

the rest of the Division. A large portion of its

responsibilities, together with a third of its

personnel, went to other branches in the Division.

The entire Division was by then provided with

security safeguards that enabled work to be done

on projects bearing special classifications. The

move brought to a close an activity that was

established to fill a gap, had done its job, and

was wound down as an independent outpost after

producing [   ] individual pieces of work.   (b)(3)

(b)(3)

(b)(3)

VIII. Conclusion

The all-source current intelligence support unit of the Cartography Division was created to make cartographic support available to components within the Agency's Special Center. It continued to fill a need over the ensuing years, not only in meeting cartographic requirements but also in the rapidly developing field of graphic communication. It worked in harmony with a wide variety of requesters and associates, and it served well during crises and during a period of expanding Agency influence in the Intelligence Community.

A curious aspect of an assignment to one of the units doing current intelligence support work was that one either loved or despised it. A neutral, take-it-or-leave-it attitude was rarely encountered. There is no rational explanation in academic managerial courses as to why it should be so, but all those who have held the post of Branch Chief in either the "X" Branch or the OCI Technical Branch look back upon their tenure with warm

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satisfaction -- despite the fact that the job offered relatively poor physical working conditions, mental strain, external pressures, long hours, frequent weekend work, and no increase in pay.

Several impelling lessons have come to this writer out of his assignment as Chief of CD/X:

a. Recognition of an individual's contribution to his profession is one of the more important rewards he can receive.

b. Busy officials who have little time to read voluminous reports are very appreciative of a map or graphic that lets them see at a glance how the present compares with the past, whether the trend is toward more or toward less, or whether the outlook is favorable or unfavorable.

c. Maps and graphics done solely to "beautify" a report are usually a waste of time.

The Agency has provided the cartographers as a group with professional standing, career development opportunities, and physical facilities always adequate to the task. This investment in managerial support has been amply repaid in that

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the Agency has always been in the forefront in matters involving thematic maps and mapping. A past chief of the Cartography Division regards the long and successful struggle to raise the professional standards of the cartographers as "our finest hour." This achievement stands in vivid contrast to the professional standings of the artists, _cum_ illustrators, _cum_ visual information specialists in the Agency, who play a vital part in getting the Agency's message across. A question that senior management would do well to consider is whether similar attention is being paid to the human side of developing the art of graphic communication.

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Appendix

Source References

The writer was closely involved with developments relating to the July 1965-June 1970 period, during his tenure as Chief of CD/X. Personal files, containing scribbled notes and memos of record, were valuable supplements to official documents in reconstructing the events of the period. The Records Center holds archival copies of all Cartography Division maps and graphic production (when multiple copies were made), filed numerically. OCI memoranda, both formal and type-script, are filed in the Records Center by date of issuance and frequently contain marginal notes concerning high-level reaction of interest to the historian. OCI's serial publications (the various weeklies and dailies) are filed by title and date.

Files held by the CIA Historical Staff were invaluable in determining the sequence of events that shaped the present DDI during the transitional period of the early 1950's.

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One of the problems in writing a microcosmic history is that many achievements, not to mention goofs and internal managerial crises, never become a matter of record. The writer has had the good fortune to be friends with most of the staff members in both graphics and cartography during the period which is the subject of this monograph and had heard over lunch much enlightening information that put the official record into perspective.

Monthly reports were a requirement in the Cartography Division from its establishment, and record copies have been retained. They are useful as leads to activities and problems but rarely provide sufficient background material to permit weighing the relative importance of achievements.

Anonymity was a passion with management of the era, making it extremely difficult to establish which personalities were involved in history-making projects. This is quite evident in monthly reports, where surnames were a rarity.

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A five- or six-digit number in the lower
left-hand corner is the only identifying feature
of graphics and maps produced by the units
described in the monograph. "X" Branch numbers
were:

(b)(3)

OCI
Graphics used a code that indicated the year,
month, day, and item. For example, [   ] shows
the item was the second job logged in on 3 April
1965. This numbering system was discontinued on
31 August 1965.

Individual source references are cited below.

Source References

(b)(1)
(b)(3)
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Figure 1. The first use of a map in the Current Intelligence Bulletin (5 August 1951).
Drawn by one of the artists in OCI, it appears to have been an experiment, since
no other maps appeared in the CIB for several months.

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(b)(6)   (b)(6)
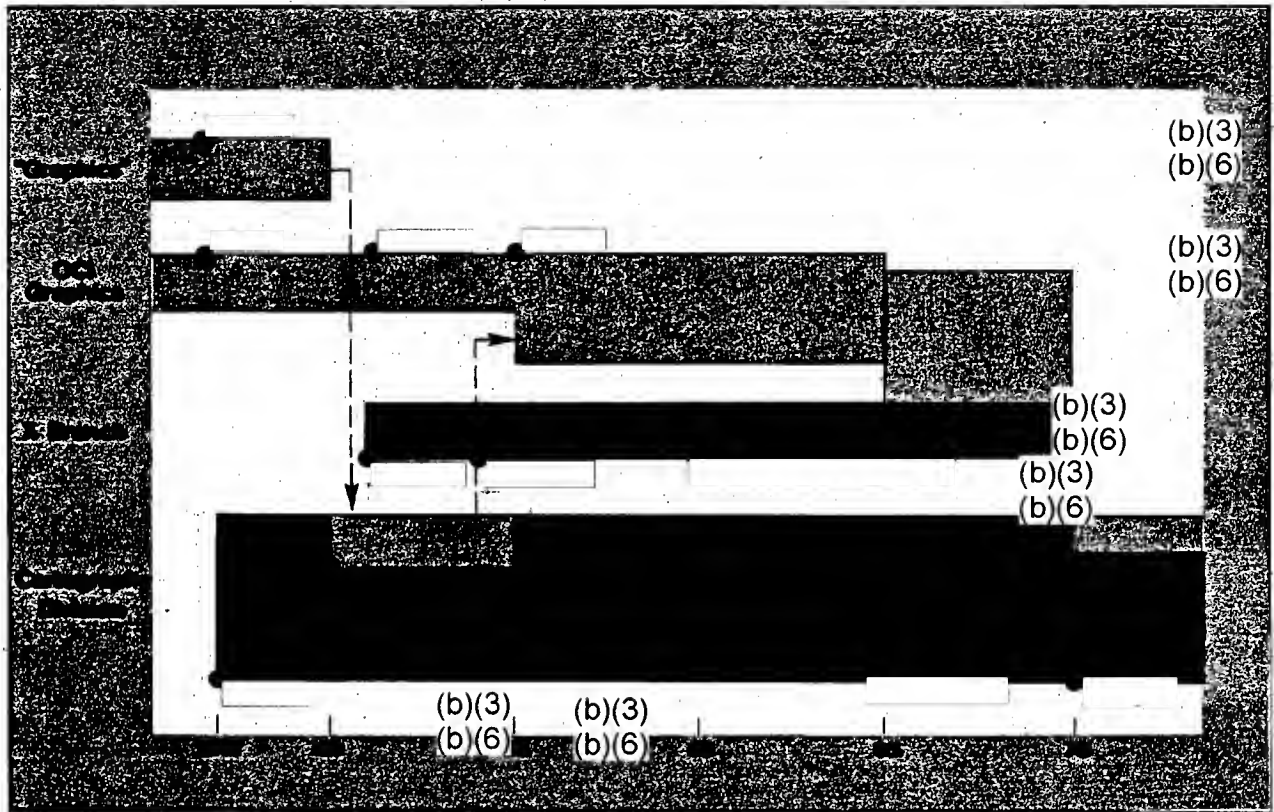
Figure 2. Cartographic and graphic units in OCI and ORR, ORE and OBGI, 1946-1970. Cartographic support to current intelligence evolved along the lines indicated on the diagram. The Cartography Division provided a stable base which supported and ultimately absorbed other units engaged in current intelligence support.

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Figure 3. Example of a [ ] map as used in the Current Intelligence Bulletin. (b)(3)
base map prepared by the Cartography Division was overprinted on a multili (b)(6)
press, using a multilith plate made with a typewriter and pencil. It represented a
major step forward in cartographic style over the crude maps used in earlier
"Bulletins."

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28 FEBRUARY 1958

I. THE COMMUNIST BLOC

II. ASIA-AFRICA

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III. THE WEST

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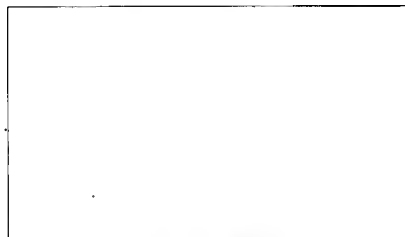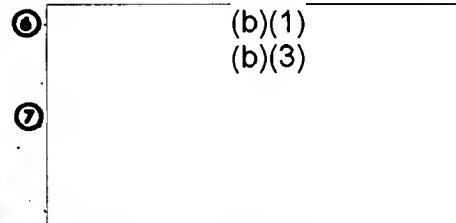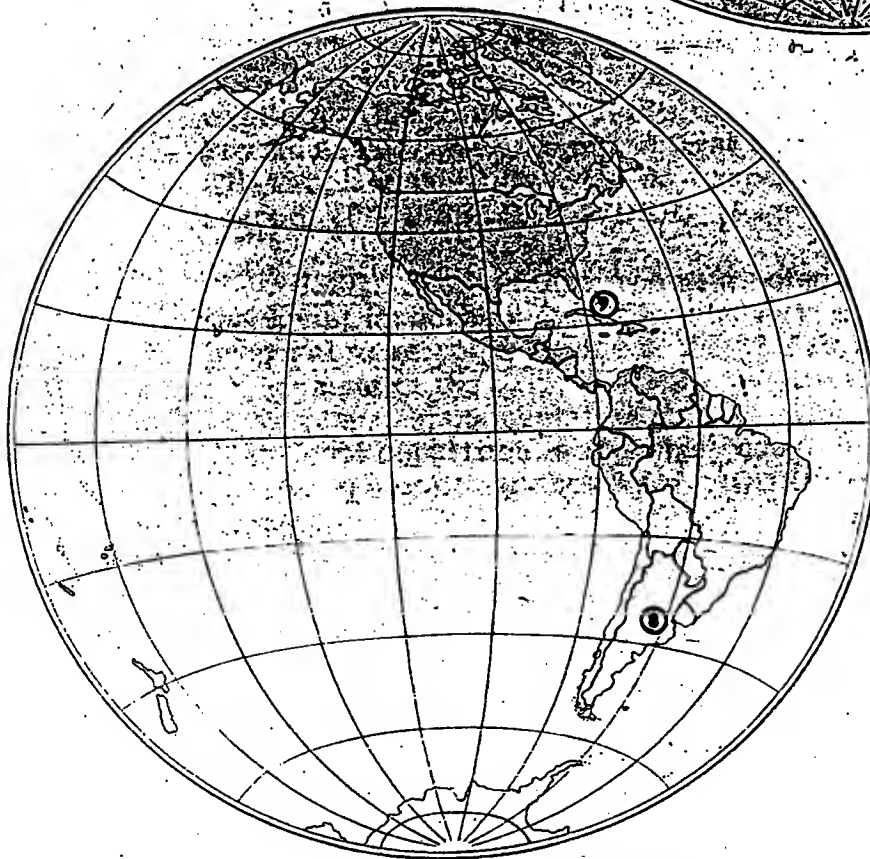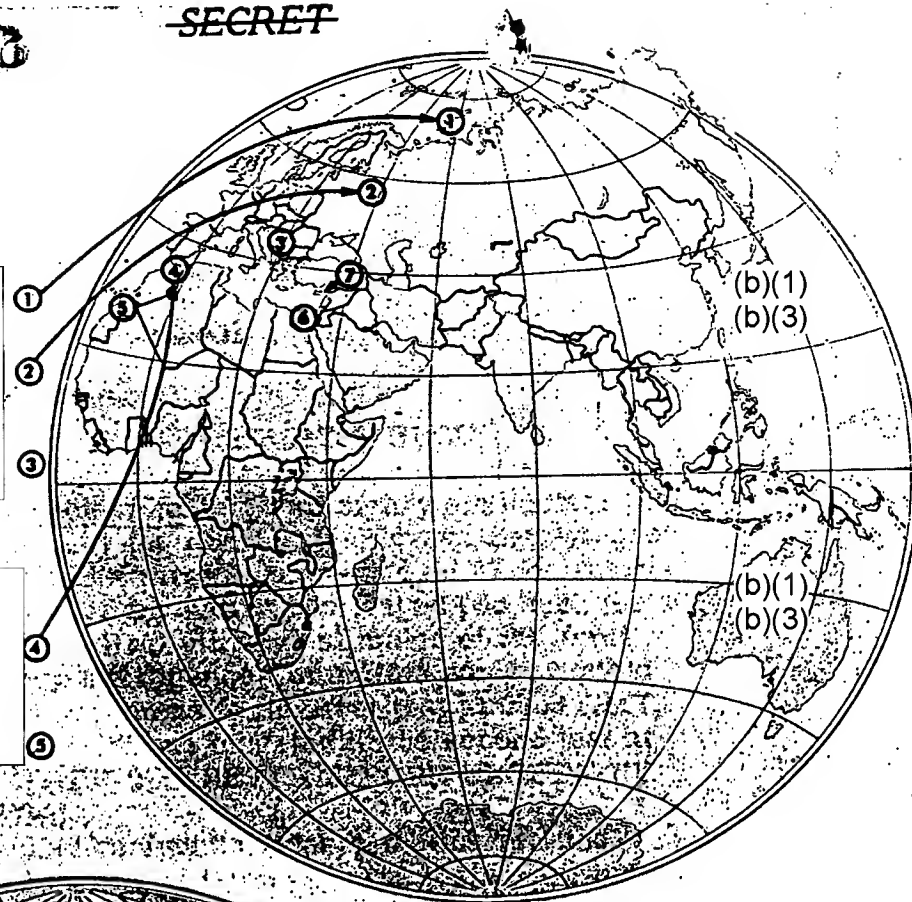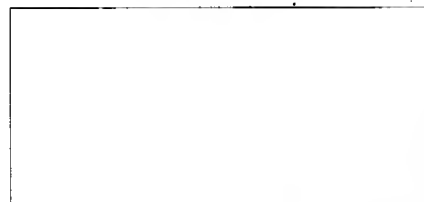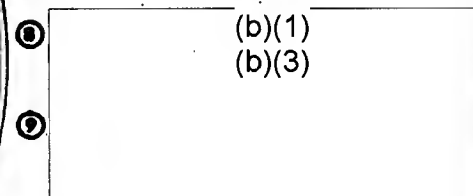
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Figure 4. Maps such as this appeared as frontispieces in the Central Intelligence Bulletins in the last years of the Eisenhower administration. They provided the President with a synop

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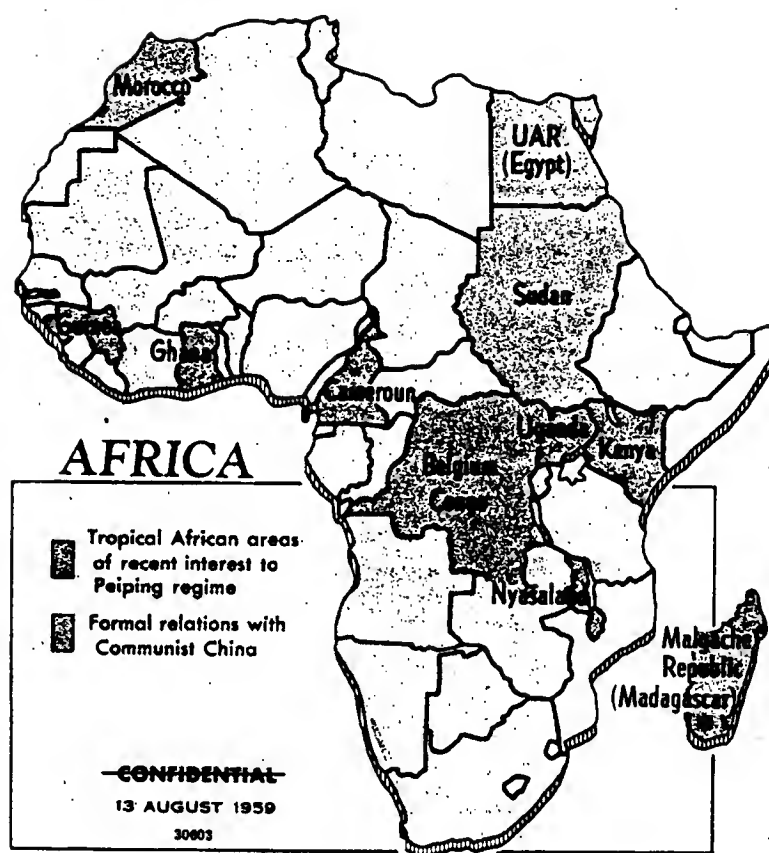
Figure 5. Maps in the Central Intelligence Review in the late 1950's reflected a high degree of correlation between text and map. Newly available printing inks provided cartographers with opportunities to experiment with design that ultimately evolved into a kind of cartographic journalism that became one of the hallmarks of CIA cartography.

CYPRUS

Figure 6. A map from the Central Intelligence Bulletin in early 1965. Such maps were pairings of base plates from the All-Source Branch and overlays made by the "late shift" officer in OCI Graphics. Quality was irregular, depending upon the availability of an appropriate base and the skill of the late shift officer.

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Figure 7. Example of a map made for a DDS&T report in the early 1960's. A high proportion of the All-Source Branch workload in that period stemmed from the heavy emphasis being placed on graphics in the Directorate of Science and Technology. Some reports contained [   ] or more photos, diagrams, charts and maps, greatly enlarging the scope of CD/X activity.

(b)(3)
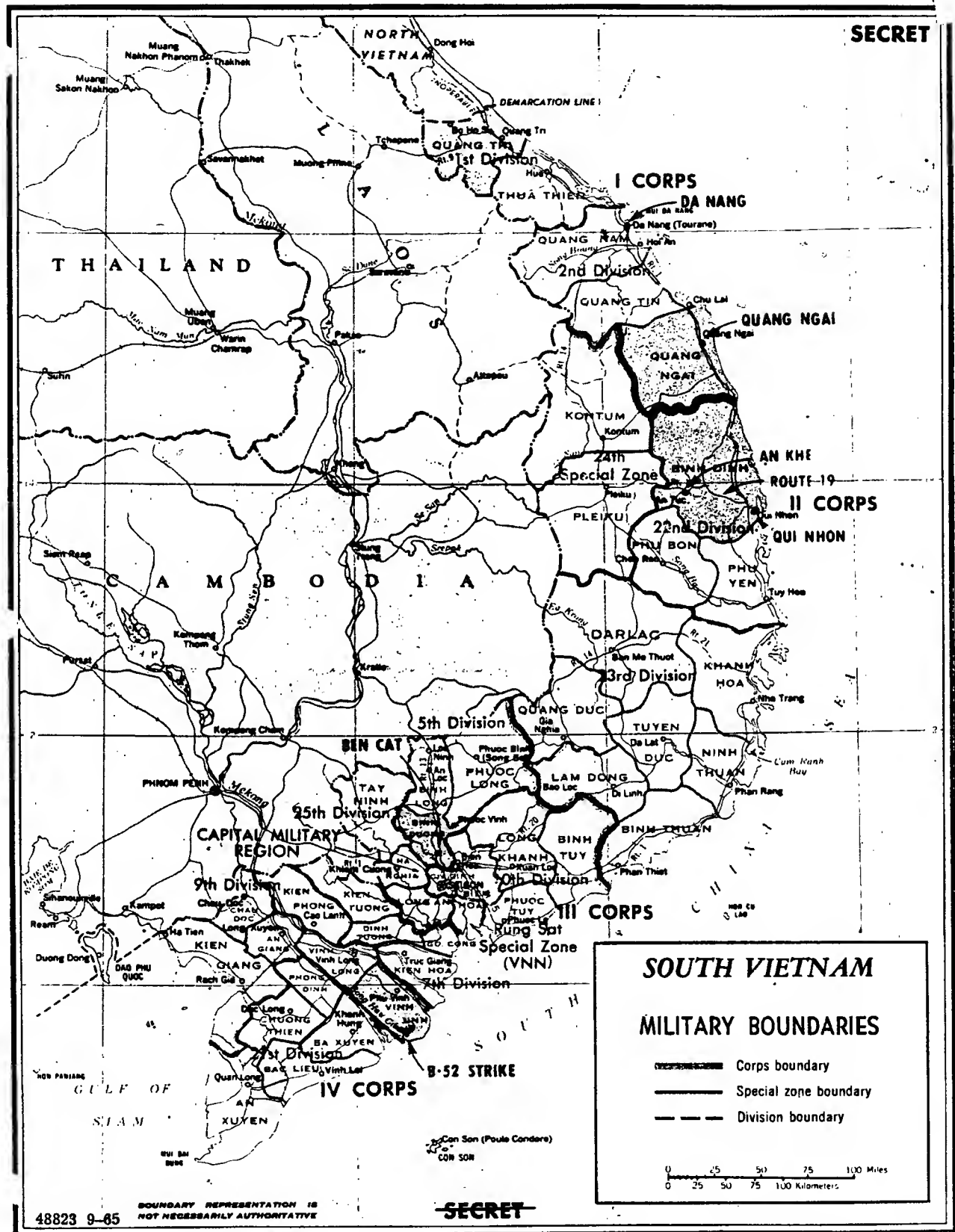
Figure 8. The "Boundary Map" of Vietnam was printed [   ] in 1964-65. (b)(1)
The version above was the first modification made to it following the merger of OCI
Graphics with the All-Source Branch. Prior to September 1965, it suffered from han-
dling problems described under Figure 6. Following the merger, clutter was removed
bit by bit and an almost stylized version was in use in 1970.
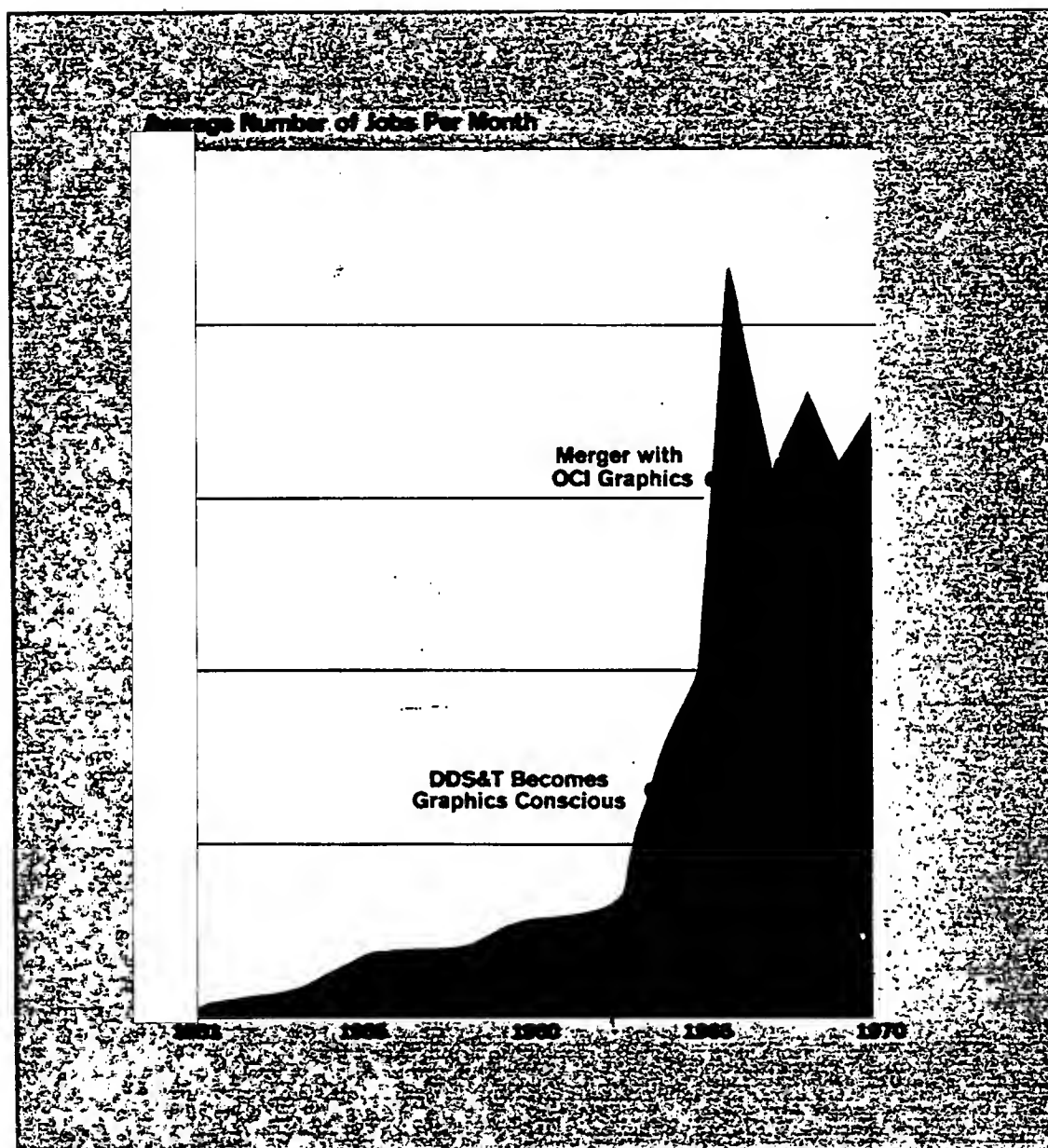
(b)(3)

Figure 9. Monthly production rate in the All-Source Branch, 1951-1970. Statistics present a generally reliable guide to the burgeoning workload in the Branch but are only part of the story. In the early 1950's almost every item was done from scratch and tailored to the needs of the Weekly. The sharp rise in the early 1960's reflects the growth in the use of graphics in DDS&T reports. Merger with OCI Graphics took place concomitantly with a sharp rise in requests associated with Admiral Raborn's directorship. More emphasis has been placed on quality rather than quantity in recent years.
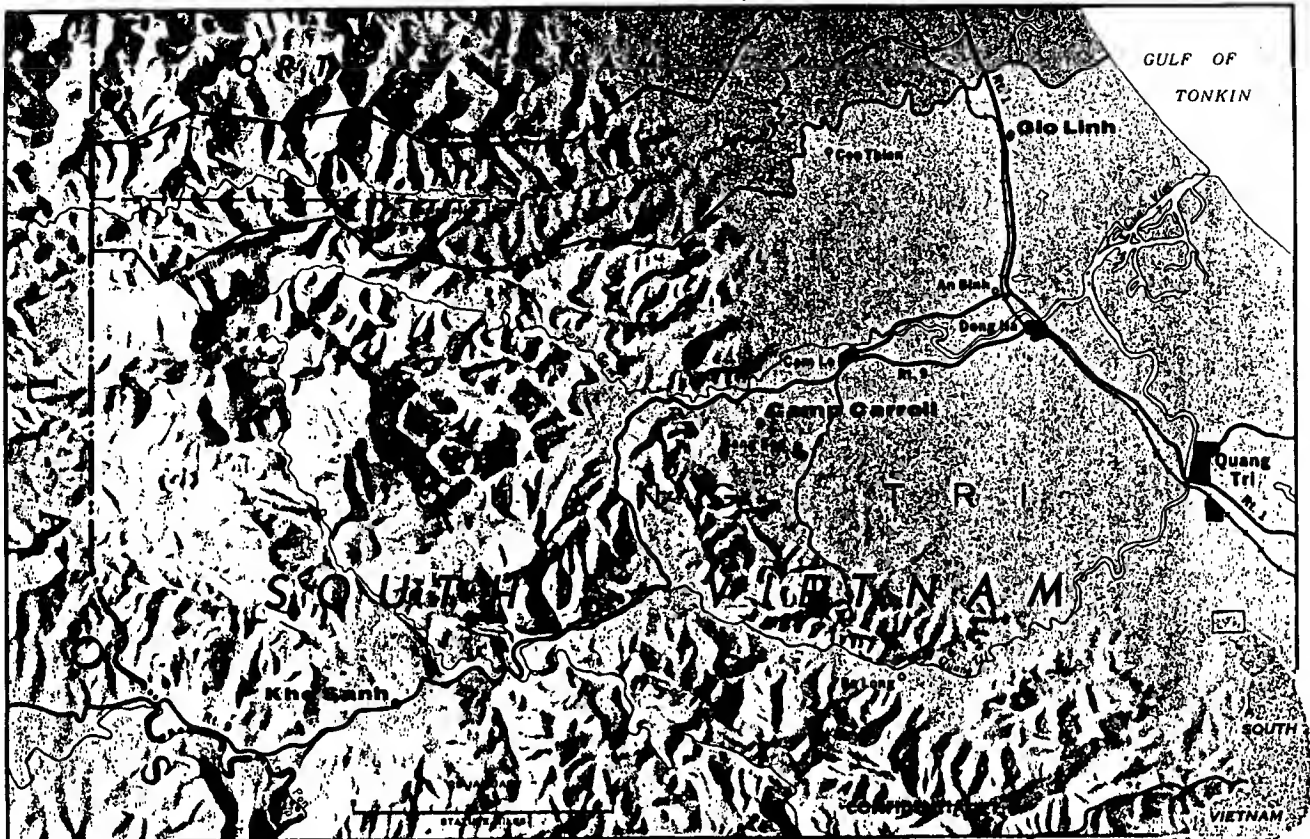
69434 1-68 CIA

Archival Record

Figure 10. Maps such as this were routinely prepared to depict military activity in crisis areas, both in Vietnam and elsewhere. They reflect a high degree of cartographic skill, employing methods beyond the ability of other government agencies reporting on the Vietnam war.

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(b)(3)

Figure 11.

The team effort to pull vast quantities of data together and process it through computers was noteworthy and helped get ADP into use on a routine basis in the Cartography Division.

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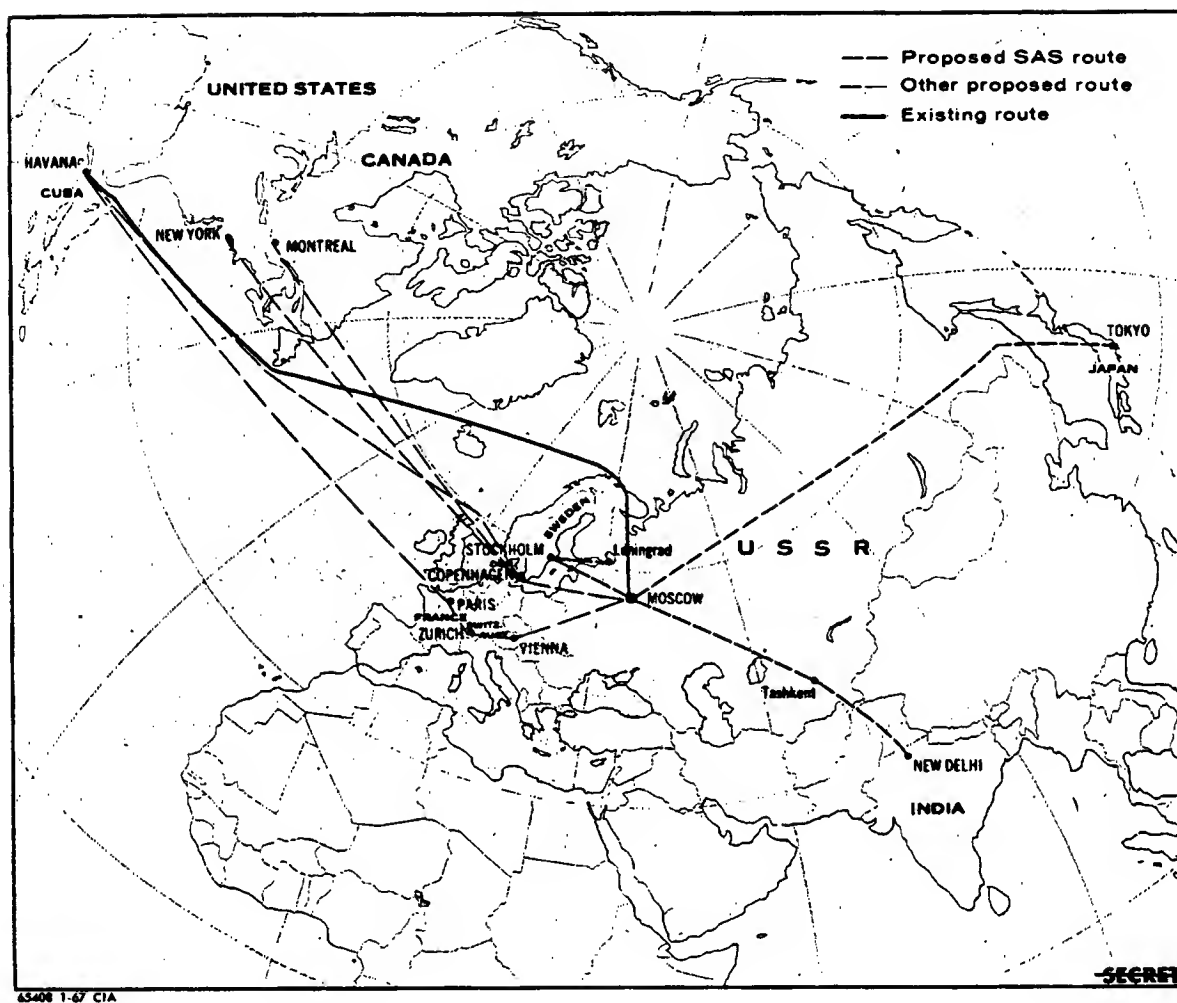
Figure 12. In January 1967, the first of many maps was constructed almost wholly by automatic data processing equipment, presaging a cartographic revolution still in the making. At this writing (March 1972) no cartographic establishment in the world has demonstrated a similar ability.
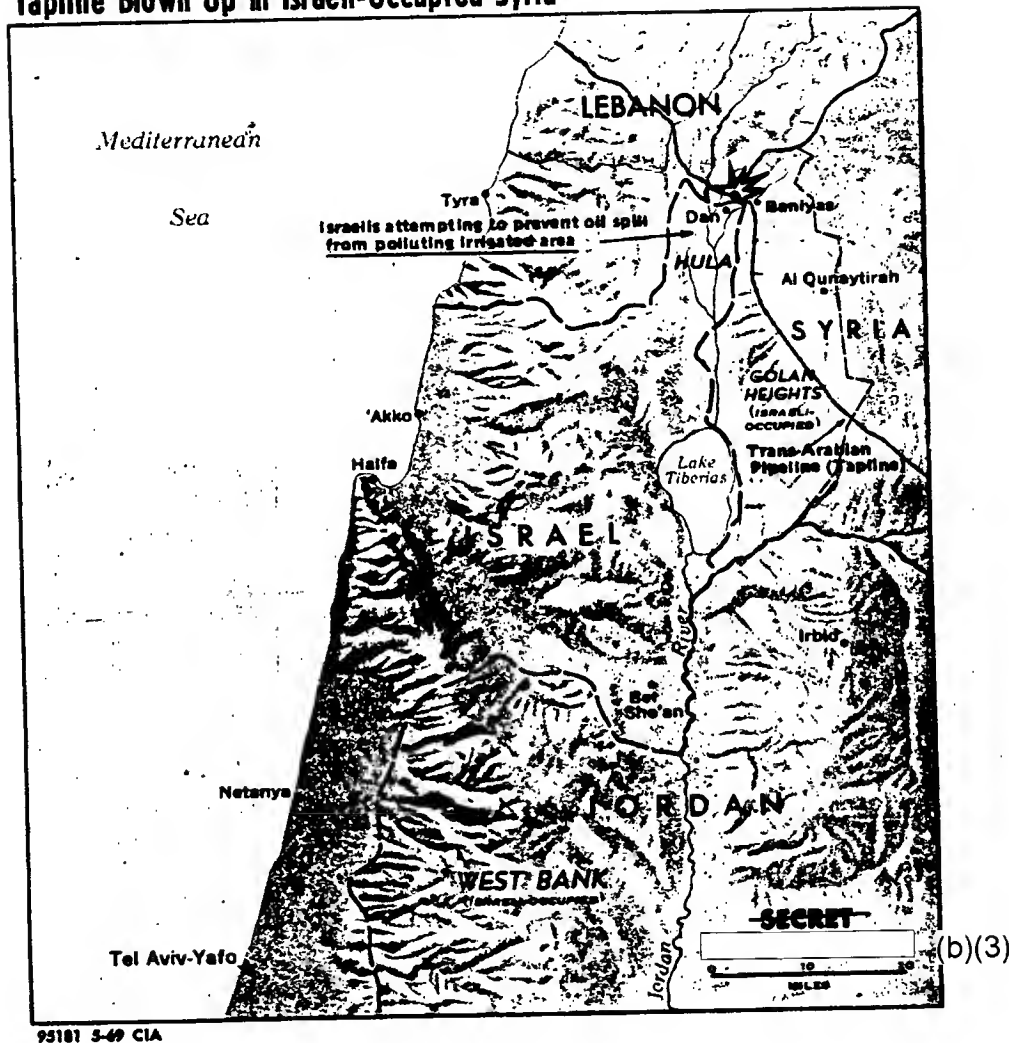
Tapline Blown Up in Israeli-Occupied Syria

Figure 13. A typical Central Intelligence Bulletin map in 1970. Continuing pressure from top Agency management to "remove the clutter" caused a cartographic style to evolve that centers on conveying a message without sacrifice to cartographic integrity.

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The Directorate of Intelligence
Historical Series

THE RESEARCH AND DEVELOPMENT OF CARTOGRAPHIC TECHNIQUES
FOR THEMATIC MAPPING

OBGI - 8

October 1971

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THE RESEARCH AND DEVELOPMENT OF CARTOGRAPHIC TECHNIQUES

FOR THEMATIC MAPPING

by

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(b)(6)

October 1971

(b)(3)
(b)(6)

John Kerry King
Director
Basic and Geographic Intelligence

HISTORICAL STAFF

CENTRAL INTELLIGENCE AGENCY

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THE RESEARCH AND DEVELOPMENT OF CARTOGRAPHIC TECHNIQUES FOR THEMATIC MAPPING

I. Introduction

A. OSS Thematic Mapping Concepts

Thematic mapping, as a profession, was virtually non-existent at the beginning of World War II. * Major mapping organizations, such as the Army Engineer Reproduction Plant (predecessor to the Army Map Service), the Navy Hydrographic Office, the Coast and Geodetic Survey, and the Geological Survey, employed conventional methods of map production which had been established in World War I days. These leisurely patterns, set in the early 1900's, were little changed by 1940. Even with the outbreak of World War II, the service organizations met the increased demands placed on them for maps by greatly increasing their staffs and by inaugurating around-the-clock production, rather than by streamlining the old, inefficient methods.

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* A thematic map emphasizes a single subject, while omitting or subordinating all other data. The production of such maps is a highly specialized art, involving the interplay of thoroughly trained research cartographers and skilled technical cartographers and draftsmen. This report deals primarily with the technical aspects of thematic map production and touches on research only as it relates to production techniques.

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The first OSS cartographers came to Washington with
degrees in geography and little practical training in cartog-
raphy. What cartographic training they had received was of
the textbook variety and constituted a general knowledge of the
conventional methods of map production. Production facilities
and equipment available to them simulated the University carto-
graphic lab environment. Despite this meager background they
quickly realized that they could not produce the variety of
thematic maps needed, with the speed and urgency demanded, by
following conventional mapping standards and procedures. New
concepts had to be developed immediately for thematic map pro-
duction and thus the foundation was laid for what was to become
the Agency's Cartography Division.

Production procedures on both the compilation and con-
struction phases were drastically streamlined. Whereas conven-
tional methods dictated a formal, hard-line approach, thematic
mapping demanded a more informal, more open approach,
especially during periods of great urgency. Conventional
methods also called for voluminous manuscript instructions and
specifications, while thematic mapping required only those
specifications needed to adequately inform the draftsman. By

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conventional methods, drafting was always performed on heavy

metal-mounted strathmore boards with extreme accuracy and

high quality workmanship; thematic mapping was executed on

light weight, easy-to-handle translucent materials at a more

realistic degree of accuracy and quality related to scale. Where-

as conventional methods necessitated costly and time-consuming

full-color press proofs for editing, thematic mapping editing was

accomplished by examining the original drawings thus eliminating

the need for a proof. The entire production process was compress-

ed for the prime purpose of speeding up production to meet the

pressures and deadlines of an increasing workload without increas-

ing the number of personnel. One fundamental concept of

conventional mapping was retained for overall efficiency -- that

of separating research compilation and drafting. It was agreed

in the early 40's, and it still holds today, that greater efficiency

of production was achieved by totally separating these two basic

phases of thematic map production.

With production procedures fairly well established, OSS

cartographers began to develop new techniques to augment the

new system. Investigation and research had to be performed

in several basic areas to expand their knowledge and use of basic

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drawing materials, inks and type. There was no specific unit
established in the OSS Cartography Division to handle these
investigations so specific assignments were made on an infor-
mal basis as the need arose. Results were generally successful,
and the new system developed a rather high degree of sophisti-
cation for the period.

At the end of World War II, the OSS Cartography Division,
Research and Analysis Branch, was transferred to the Depart-
ment of State in anticipation of the establishment of a new intelli-
gence organization. There it remained until 1947. During this
period there was too little work for too many people, and it
became necessary to improvise work to keep the cartographers
busy.

An experimental Lab unit was informally established to
investigate new cartographic techniques that had been developed
by the major mapping organizations as a result of war pressures
and to work up basic concepts on thematic map symbolization.
In pursuit of this aim, visits were made to other governmental
mapping agencies. One such visit to the Cartographic Lab of
the Coast and Geodetic Survey was so impressive that the visit-
ing cartographers strongly recommended a similar setup in any
future thematic mapping organization.

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B.   United States Postwar Commitments Produce New
          Pressures for Thematic Maps

The advice and recommendations of the experimental Lab

unit were heeded. When the Cartography Branch was transferred

to the Agency in December 1947, its new organization included a

cartographic lab. Subsequent US foreign commitments put

extreme pressure on the Cartographic Branch to produce thematic

maps to support Agency requirements. The rebuilding of Europe

under the Marshall Plan, the imposition of the "Iron Curtain",

the Berlin Airlift, the creation of NATO, the takeover of China

by the Communists, the first Soviet nuclear explosion, and the

Korean conflict were happenings that led to demands for more and

more thematic maps to support briefings and to provide expanded

graphic support to the economic, political, and military research

and operational efforts of the Agency. The pressure to increase

production continued, and it intensified the need for more efficient

production procedures and techniques to meet these demands.

Throughout the history of the Cartography Division there

was, for one reason or another, a constant shortage of drafts-

men. The imbalance between compilers and draftsmen was cited

regularly as a major problem in Division monthly reports in the

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1950's, and the situation continued through the 1960's. Short-
ening the draftsman's time to complete an assignment was the
only means of keeping abreast of the problem.

These compelling influences gave the impetus that led to
the development of the procedures and techniques employed
today and put the Agency's Cartography Division in its position
of leadership in thematic map production.

C. The Four Periods of Technical Development

During the entire reporting period (1947-1970) cartographic
research and development was given the highest degree of backing
and support by Division and Office management. Office Directors,
Dr. Otto E. Guthe (1947-1965), Mr. James A. Brammell (1965-
1970) and Dr. John K. King (1970 -), and Division Chiefs, M(b)(3)(b)(6)

[   ] (1947-1965), Mr. [   ] (1(b)(3)(b)(6)

1970), and Mr [   ] (1970 -). fully supported every

move to keep the Agency's cartographic effort in the forefront. (b)(3)(b)(6)

Despite this dynamic approach by management, the fact could
not be altered that Lab effectiveness was always dependent on
the ability, motivation, and imagination of the Lab personnel
assigned to perform the investigations, research, and development.

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Therefore, the history of the Cartography Division's efforts
in this developmental field can be divided into four periods.
Three periods related to the persons occupying the Lab position
during these years. The fourth period occurred after the Lab,
per se, was abolished for the lack of a suitable person to fill
the position. Also during this final period, the Division's
mission expanded so greatly that despite management's feelings
regarding research and development, there was no alternative
but to support critical production problems in preference to
research and development. The four periods were: 1947-1954,
1954-1962, 1963-1964, and 1964-1970, with the most vigorous
and meaningful development occurring during the second period.

During this entire interval the Division was constantly con-
fronted with requests for maps which, because of their urgency
and/or odd requirements, necessitated adjustments or modifi-
cations to the standard operating procedures of the time and
continually tested its organizational flexibility. These ad hoc
situations occurred hundreds of times over the years and
significantly enhanced the Division's outstanding reputation for
being able to produce the "impossible job" by the required dead-
line. Ad hoc procedures will be discussed in a separate section

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and two projects, a model for the Special Assistant for

Vietnam Affairs (SAVA) and a map for the [ ]

[ ] will be discussed in detail.   (b)(1)
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II. Chronological Development (1947-1970)

A. The [_____] Era: A Period   (b)(3)
of Relatively Low-key Development (1947-1954)   (b)(6)

1. A Cartographic Lab Becomes Part of the New Agency Cartographic Organization

In December 1947, the former OSS Cartography Division was formally transferred to the Central Intelligence Agency and became the Cartography Branch of the Map Division. The Branch was comprised of four Sections: three Research Sections responsible for performing cartographic research and manuscript preparation, and a Construction Section responsible for the technical aspects of map production. The latter contained a Drafting Unit, a Type Unit, and, most significantly, a Cartographic Lab. In August 1952, the Cartography Branch was elevated to a Division, and the Construction Section became the Development and Construction Branch, putting, as the name implied, further emphasis on research and development. Several years later the name was changed to the Technical Support Branch. To lessen the organizational confusion the Agency's cartographic organization will hereafter be called the Cartography Division.

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The experience gained and the success achieved by the experimental Lab unit during the interim period with State proved beyond a doubt that a Cartographic Lab was critical to any future cartographic organization. Management, recognizing the value of cartographic research and development, formally included the Lab in the new organization. The Lab's responsibilities were: 1) to investigate and introduce new drafting and compiling techniques, materials, and equipment; 2) to develop training and working aids for compilers and draftsmen; 3) to develop new symbols and establish and maintain orderly symbol files; 4) to work with reproduction to upgrade the quality of printed maps; 5) to keep abreast of developments in the field of cartography; and 6) to train new personnel.

2. Lab Personnel Are Selected

The management of the Cartography Division discovered quickly that all research and development problems were not automatically solved by merely having a Cartographic Lab as part of the organization. Well trained, highly motivated, technically inclined cartographers had to man the unit to make the headway desired. The problem of finding suitable Lab personnel faced the Branch in 1947 and several times thereafter.

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A careful review of Branch personnel led to the sele(b)(3)

tion of Mrs. [   ] and Miss [   ] as the first(b)(3)
(b)(6)

Lab "men". Mrs. [   ] had been with the organization in(b)(3)
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OSS days, and Miss [   ] was with the Division of Geography

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and Cartography, Department of State, before joining CIA. B(b)(6)

had thorough training and experience in all phases of thematic

map production. In addition, both had an artistic flair which was

of considerable value for the informal program in mind at the

time. As was to be learned later, neither Mrs. [   ] nor(b)(3)
(b)(6)

Miss [   ] had special technical competence, so projects (b)(3)
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which involved the designing and constructing of mechanical aids

had to be abandoned. They did, however, accomplish much by

producing compilation and drafting aids during their tenure.

Mrs. [   ] resigned from the Agency in May 195(b)(3)
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and Miss [   ] was promoted to compiler and transferred to(b)(3)
(b)(6)

a Research Compilation Section at approximately the same time,

leaving the Lab unoccupied for a short period. (b)(3)

In mid-1952, Miss [   ] and Mr. [   ] (b)(6)

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[   ] were chosen to take over the Lab responsibilities. Bo(b)(6)

were cartographic draftsmen with several years experience. (b)(3)
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Miss [   ] had an art background, and Mr. [   ] had been

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called upon numerous times to assist in jobs that went beyond

his drafting responsibilities. They were considered the best

choices at the time to keep the Lab alive. Miss [   ] (b)(3) (b)(6)

devoted her major effort to training new personnel, which will

be explained later. Mr. [   ] continued to support the Branc (b)(3) (b)(6)

on assignments that fell beyond normal drafting responsibilities

and were turned over to the Lab for processing. The [   ] (b)(3) (b)(6)

[   ] era produced very little. Miss [   ] resigned from (b)(3) (b)(6)

the Agency in October 1953. Mr. [   ] remained as the only (b)(3) (b)(6)

Lab man until he resigned in February 1954.

3. Problems of Development During This Period

The full potential of a Cartographic Lab was never

realized during this period which spanned the late 1940's and

early 1950's. Part of the problem lay in the Lab personnel who

were just not capable and imaginative enough to meet the real

challenges that confronted them. This, of course, was not

fully realized at the time but became apparent in retrospect.

The rest of the problem lay in the fact that not all avail-

able Lab time was devoted to pure Lab-type assignments. The

Lab was assigned at the outset the responsibility of training new

personnel, both draftsmen and compilers. Lab personnel were also continually tapped to support regular map production.

The training program was developed to indoctrinate all draftsmen and compilers into the specialized world of thematic mapping and to give appropriate training to enable them to make the transition to full production with the least amount of stress. A full line of projects was developed to carry the draftsman from the most elemental task to the most complicated. High levels of quality had to be achieved for each project before passing to the next. All new draftsmen, even those with considerable prior experience, were put through the program to assure that they understood clearly what was expected of them.

All compilers were also put through the same program but for a different reason. The output of the compiler was a manuscript map from which the draftsman prepared his final drawings. Although he was not preparing final copy, the compiler's work on this manuscript had to be succinct and unambiguous to avoid any possible misunderstanding by the draftsman. By going through the series of drafting projects the compiler improved his ability to prepare the manuscript. He also gained an excellent appreciation of the skill and exactitude required of the draftsman

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to meet his specifications. Additional work was given to the
compilers on type recognition and selection and the prepara-
tion of concise specifications and type orders.

The program required an average of eight weeks to
complete and demanded almost full time and attention from the
Lab instructor. Very little Lab work could be undertaken while
the training program was underway and, with many new persons
entering the Division during this period, the program was con-
ducted frequently.

Regular production at this time was building steadily
because of the demands being placed on the Cartography Division.
There was always an acute shortage of drafting help. Because
of the relatively low priority of its work, aside from training
new personnel, the Lab was repeatedly called upon to supply
assistance to the Drafting Unit, usually by assigning the second
person but quite often both Lab persons. When this occurred,
Lab projects that happened to be underway were naturally delayed.
The Lab was also a catchall for unique odd jobs so even the rela-
tively little time available for Lab work was further diluted with
these numerous small assignments.

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During this period the time available to further true

Lab-type efforts was well below 50 percent of the total. These

were years of "getting up steam" for the Branch. As experi-

ence was gained under the new organizational setup, many areas

of potential need for Lab support were recognized. Prime needs

were considered, and those projects were selected which coul (b)(3) (b)(6)

be readily handled by the [   ] or [   ]   (b)(3) (b)(6)

teams. They included the preparation of line-weight guides,

type guides, printing color guides, handbook pages, and symbols.

Although not research projects, they were still in the realm of

Lab assignments, the results of which would save many hours of

compilation and drafting time and, in turn, greatly increase the

efficiency and quality of the general production scheme.

4. **Significant Lab Accomplishments During This Period**
    in the Form of Cartographic Aids

As stated above, the production of thematic maps was

divided into two separate operations: 1) the preparation of a

manuscript by the research compiler who was basically a geog-

rapher/cartographer, trained to extract the substantive details

from various sources; and 2) the production of the final drawings

by the skilled draftsman who was versed in the technical aspects

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of map construction. Under this arrangement, guidelines were

an absolute necessity in order to harmonize the production of a

number of compilers, to establish uniform standards, and to

allow compilers to communicate with the draftsmen. Essen-

tially, the need to coordinate the production efforts between the

two groups was the impelling force behind the development of

guides of all kinds.

a. Line-weight Guide

The line-weight guide was developed and prepared

to ease the compiler's problems in designing the map. With

this visual aid, which depicted page-wide samples of all line

weights available to him, the compiler visually checked the

guide against the manuscript to make his selection. The reverse

side of the page carried samples at 25 percent and 50 percent

reductions to demonstrate the effect of reducing the originals.

The draftsman, in turn, used the guide in selecting pens to

match the specified weights when preparing the final drawings.

The Leroy lettering point was used to achieve lines

from 0.012" to 0.15". Numerous samplings of each point were

made. Tests with a 40X shop microscope showed that the same

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numbered points produced a variety of line weights -- off but

a minute fraction, but significantly enough to upset a close

balance on occasion. The average of each point was then

determined, and this became the weight of the line that

appeared on the guide. Once the guide (Figure 1)* was dis-

tributed in paper and transparency form, virtually all con-

flicts concerning line weights between draftsman and compiler

vanished.

Several years later a line-weight guide for the

Pelikan pen was issued to supersede the Leroy guide.

b. <u>Type Guide</u>

The type guide (Figure 2) was prepared primarily

for use by the compiler in selecting styles and sizes of type in

designing the map. The Lab designed each page to show all

the available sizes of an individual style by showing words in

all capitals and in capitals and lower case, plus numerals at

each size. In addition, the complete font (all letters, numerals,

and punctuations available) was shown in a small size. The

reverse side of each page also contained sample reductions of

_____

* All figures appear at the end of the text.

25 percent and 50 percent for added usefulness. The type guide

was used by the draftsman to verify the type against the type

order prepared by the compiler.

Additional type styles were added to the guide over

the years, but the basic format, which had been excellently

designed, did not change.

c. Color Guide

This guide (Figure 3) was unique in its conception

since nothing similar had ever been designed specifically for

the compilation and construction of thematic maps. It was, in

a real sense, a visual comparator for the compiler to use in

making design judgments in the selection of lines, symbols,

tones, and type as related to color.

The Lab designed a page which contained a care-

fully selected group of symbols, lines, patterns, tones, and

type, arranged in such a way as to provide the compiler with a

visual image of what he could expect to get if he chose one, or

a similar item, when printed in the color of his choice. Since

he had this same page in all colors, the compiler had the means

to visually support his cartographic design judgments.

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Like the two other guides, the color guide was also a help to the draftsman in type positioning. By referring to the guide he was able to determine the hierarchy of overprinting based on color and screen as selected by the compiler.

The color guide went through two subsequent revisions between 1950 and 1966. Each revision, however, adhered to the original basic design concept to give the cartographer a means to make intelligent judgments.

d. Symbol Guide

The use of preprinted symbols to replace the tedious, time consuming hand-drafted variety began in OSS days. From the early 1940's to 1952 a sizeable collection of abstract, pictorial, and military symbols had accumulated. They were extremely useful and had saved an incalculable amount of manpower in that time. It was, however, a hodgepodge, unorganized collection. In line with the development of a more professional, viable organization the Lab was directed to give order and direction to the symbol problem.

To simplify symbol use, the Lab carefully determined standard sizes, and, where necessary, symbols were

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enlarged or reduced to fit these standards. Symbols were numerically indexed. Sizes were assigned letter designations. Once these standards were instituted the preparation of symbol pages began. The resultant guide (Figure 4) became a series of symbol pages organized to provide better communication between the compiler and draftsman and to provide a visual image of the various available symbols in their different sizes to aid the compiler in his design efforts.

During this early period of development, continued requirements for additional symbols were turned over to the Lab. As these new symbols were made part of the file, new pages were produced to keep the system as up-to-date as possible.

To assist the draftsman in his efforts, a file was established to make locating the preprinted copy a simple operation. In connection with it, display panels were produced for location and identification.

The symbol file remained in this form until a major revamping was undertaken during the next period of Lab development.

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5. Other Lab Accomplishments During This Period

Information on various cartographic developments was being received by the Cartography Division through personal contacts with cartographers of other agencies (foreign and domestic) and at professional meetings such as the American Congress on Surveying and Mapping (ACSM) and the Visual Communications Congress (VCC) conventions. Even though the bulk of available Lab time went into preparing and maintaining the guides, some effort was put into those new developments which were deemed important enough to be of immediate benefit to the Division. Two of these were the testing and introduction of the German Pelikan pens and inks and the introduction of plastic as a drafting and compilation medium.

a. Pelikan Pens and Ink

As compared to topographic mapping, where an 0.010" line was considered a heavy line, thematic mapping required the use of lines up to 0.15". Obtaining these heavy line weights on a consistent basis was a problem. Leroy lettering points were used by the draftsmen to obtain lines from 0.010" to 0.15" in weight. The practice dated back to early OSS days.

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Leroy pens were difficult to use because of their design and their poor quality of construction resulted in varying line widths from identically numbered points. However, they were the only pens available to do the job required.

In the late 1940's the Gunther-Wagner Company of Germany introduced the Pelikan tubular "fountain" drawing pen with a variety of nibs. A complete set of these pens and points was procured by the US Geographic Attache in the area, and tests were made to determine their possible substitution for the unhandy Leroy points.

At first glance the new pens gave a feeling of confidence. They were constructed with typical high quality German craftsmanship, and they performed to match their appearance. The ink-containing barrel completely eliminated the continual refilling required by the Leroy points. Ink flow was excellent, and the rate of flow could be regulated by exchanging feeds and could be set to match the speed of individual draftsmen. Cleaning the Pelikan nibs was very simple. A small wire insert was put in place after use, and a day's supply of used nibs could be cleaned at the end of the day by simply running water through them. Most important, the uniformity of line was

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excellent from one point to another, attesting to the superior

manufacture. The Pelikan pens were introduced as standard

equipment to replace the Leroy pens, and the quality of inked

drawing immediately improved.

The Gunther-Wagner Company also produced a

Pelikan ink in several varieties. Samples of these were tested,

and the Pelikan Black No. 17 proved far superior to the Higgins

ink then in use. After the Pelikan ink was substituted for the

Higgins on a regular basis, occasions of graying lines were

experienced. These occurrences were disturbing because

they created lost motion on the draftsman's part to retouch

the gray lines. Experiments proved that by further concentrating

the ink by air evaporation, a much more dense line was achieved.

This practice became a standard procedure each time a new

supply of ink was introduced into the drafting operation. (The

evaporation, however, was hit or miss until Mr. _____ (b)(3)
(b)(6)

future Lab Chief, later approached the problem on a more

scientific basis and established a definite procedure. The Pelikan

ink was evaporated in a specially constructed pan to a specific

gravity of 11.5° minimum to 12.5° maximum Baume. This pro-

cedure consistently resulted in high quality linework).

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b.   The Introduction of Plastic as a Drafting Medium

In the early 1950's the Cartography Division was introduced to a new vinyl plastic material, trade named Dyrite, by Mr. Samuel Sachs of the Coast and Geodetic Survey. The raw base of Dyrite was produced by the Bakelite Corporation and processed by the Direct Reproduction Corporation of Brooklyn, New York. Processing the 0.010" thick plastic involved running the raw material through the same series of graining processes used for graining zinc lithographic press-plates, with glass marbles and sand -- the longer the graining and the finer the sand, the more delicate the grain. Samples with various grades of grain were purchased from the New York company, and a series of tests were begun by the Lab.

At this time, a chemically grained Kodak acetate base material was being used for compiling and drafting. It was the only material of its kind at this time. Being nonstable in nature, it caused constant problems of registration (the exact matching of one drawing to another) by its contraction and expansion. Dyrite was relatively stable. The minute changes in its size were insignificant when compared to acetate. Inking tests

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showed that the Pelikan Black No. 17 produced high quality

linework. Dyrite's hard and durable surface made corrections

simple by permitting removal of inked lines with a sharp

X-Acto knife, and this extra advantage would save considerable

drafting time over the difficult-to-correct acetate. Dyrite be-

came the standard medium for drafting and compilation and

replaced all other media. Over the next 15 years several com-

panies introduced competitive products which were tested as

possible replacements for Dyrite. In every instance, Dyrite

proved superior. In 1969, however, a new material, Keuffel &

Esser Stabilene Drafting Film, which vied favorably with Dyrite,

was put on the market but, because of its extra expense, its

use was still in question at the end of this reporting period.

6. Other Development and Construction Branch
   Personnel Become Involved in Experiments

During this period, with production ever increasing,

it became very important not to lose sight of developments at

other agencies. Key Branch personnel made occasional visits

to other organizations to assure that the Division was at least

aware of happenings in the cartographic field beyond the limited

capability of the Lab. Contact with Mr. Sachs' Lab at the

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US Coast and Geodetic Survey (USC&GS) was kept active and proved to be invaluable. Two new developments were observed there which later made significant impacts on the Division. They were a new method of registration by means of a punch hole and pin and a revolutionary way to produce lines by means of scribing (engraving) on plastic.

a. Introduction of a Punch Register System

What is registration and why is it so crucial in cartographic production? In the cartographic production process, a manuscript worksheet is compiled which contains in graphic form all the elements that combine to make up the final map. The manuscript is usually prepared in colored inks or pencils to distinguish one element from another, and the worksheet can be viewed as a complete map in the "rough" stage of production. In order to print multiple paper copies of the manuscript worksheet, the draftsman, following specifications supplied by the compiler, actually separates each element onto a separate drawing. For example, the international boundaries are inked on one drawing, the railroads on another drawing, the coastline and rivers on another drawing, the open-water areas on another, etc.

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The sucess of the entire system, from compilation to repro-
duction, depends on how accurately the separation drawings
are matched to each other throughout the process, the ultimate
aim being to reproduce the original manuscript on paper in
multiple copies by means of the drawings with every element
in its exact position relative to all other elements.

During the drafting process, each drawing is
affixed with either a series of four corner registration marks
aligned to the corners of the neatline (the fine borderline of a
map) or three cross registration marks positioned at top center
and left and right center beyond the map image for maps with
exceptionally heavy or no borderlines. While acetate was in
use as the prime drafting medium, the continual changing of
the material, because of its instability, forced the draftsmen
to shift these registration marks repeatedly. These marks were
in turn used by the reproduction plant to register the negative
before transfer to pressplate and from pressplate to printed
copy. By the time a long-term map was completed it was any-
one's guess as to how the individual drawings would register on
the final paper-printed copy. When plastic was introduced, the
problem was deemed under control because of the excellent sta-

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bility of the new material and because, once positioned, registration marks on it rarely had to be shifted.

From the very beginning, separation drawings were secured to the manuscript and to each other by means of drafting tape. It was not uncommon in the old days to see every compiler's and draftsman's work area littered with hundreds of pieces of drafting tape as a result. In the course of producing a multicolor map, the draftsman, in performing his job, and the compiler, in checking the draftsman's work, shifted manuscript and drawings many, many times to achieve various combinations. Each shift required untaping, reshuffling, and retaping -- a costly and time consuming process. The USC&GS's new punch system completely eliminated all this lost motion and effort.

The new system involved selecting the number of sheets of plastic required for a given job and placing them over the manuscript. With a 1/4" round-hole hand punch, two widely spaced holes were punched in the open margin at the top and through all the sheets simultaneously. Two rivets, slightly larger than the punched holes, were supplied and slipped into the bottom sheet of any combination. Subsequent sheets were merely positioned over the protruding rivets, and the pieces

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were in perfect registration with each other. There was no

limit to the amount of juggling and shifting that could take

place without jeopardizing the accuracy of the registration.

Testing and developing in the Division was per-

formed by Mr. [   ] then Chief of the   (b)(3)
                                                          (b)(6)

Development and Construction Branch. He initially purchased

a common ticket punch from a local hardware store and found

suitable rivets at a machine shop. When the system was intro-

duced in 1950, the results were immediately felt, not only in

the saving of manpower by eliminating tape registration, but in

the upgraded accuracy of registration of the printed images. A

few years later several commercial hand punches and brass eye-

lets were purchased to improve the operation. This system

remained in use until 1967, when the intermixing of various

plastic base materials having varying degrees of stability forced

a change.

b. Initial Contact with Scribing

The second major advance in cartographic produc-

tion discovered at USC&GS during this period was plastic scribing.

Mr. Sachs had modified instruments used to engrave on glass by

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substituting ordinary steel phonograph needles for diamond

cutters. The phonograph needles were then honed to the desired

line weights by a series of specially designed sharpening jigs.

Mr. Sachs formulated a paint coating which he whirled onto

sheets of clear vinyl plastic. The manuscript image was then

transferred, in reverse because he was creating a negative,

onto the coated surface by a photographic blueline process.

He then proceeded, as in conventional drafting, to scribe

(engrave) the specified elements on each sheet of plastic. The

quality of the scribed linework was outstanding in its uniformity.

Even at 40X enlargement the linework quality was still excellent.

The implications of this technique were tremendous. It took

many years to train a draftsman to produce top quality ink-drawn

linework which would approach the scribed quality. With scribing,

it would require substantially less time to become expert. Top

draftsmen were still hard to come by, and increasing the quantity

and quality of the Drafting Section was a prime goal.

Shortly after this initial contact in 1952, Mr. (b)(3)
(b)(6)
Deputy Chief of the Development and Construction

Branch, spent a week at USC&GS working with Mr. Sachs to

learn the details of the new process. He returned to his Division

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greatly enthusiastic about the potentials of scribing but with the recommendation that nothing be done in-house until Mr. Sachs had refined his system which was to become a revolutionary development in the world of cartography.

7.   Recapitulation of the Period

This initial period saw the Cartography Division develop into a highly professional and specialized thematic mapping organization. Although not revolutionary, most of the technical developments during this period were significant contributions toward the furthering of this professionalism.   The production of cartographic aids in the form of compilation and drafting guides were major efforts, and the guides stand today because of the thoroughness of thought and design put into them.

The introduction of Pelikan pens and ink and the discovery of Dyrite plastic as a drafting medium enabled the Drafting Section to increase both the quality and quantity of its production while faced with an ever increasing workload.

The punch register system did introduce a minor revolution in the way drawings were handled during the construction and editing process. Its introduction led to the saving of countless hours of drafting and compilation time.

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Although recognized as having future potential, scribing did not become a significant factor during this period. The groundwork was laid, however, for a later deep involvement in the process and for the Cartography Division actually taking the lead in developing certain phases of the system.

B. Period of Vigorous Development (1954-1962)

(b)(3)

1. Mr. [   ] Takes Over the Cartographic Lab (b)(6)

After Mr. [   ] resigned in February 1954, the Car (b)(3) (b)(6) graphic Lab remained unoccupied for several months. This was a period of progress at the major mapping organizations, and it was imperative to keep the Lab operation active to keep abreast of these developments. A thorough search of Division personnel (b)(3) led to the selection of Mr. [   ] to head the Lab. (b)(6)

Mr. [   ] entered the Agency as a cartographic dra: (b)(3) (b)(6) man in 1950. His success as a draftsman enabled him to move into the Cartographic Aid Section in the Development and Construction Branch. The Section had been created in 1953 to handle the numerous jobs that did not fall into the regular production scheme of the Division. Its personnel had to be technically skilled and innovative, and Mr. [   ] did an excellent job in that (b)(3) (b)(6) Section. He moved to his new position in July 1954.

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2. A Broad Lab Program Is Formally Approved

Mr. [____] began immediately to review the previou(b)(3) (b)(6) efforts of the Lab and in a short time, in conjunction with the Deputy Branch Chief, submitted a challenging program of re- search and development. This was the first time that a definite Lab program had ever been established to formalize directions and goals. The seven-point program called for a major effort to improve the quality of the final product, increase productivity by introducing new time-saving techniques and procedures, and improve the welfare of Division employees by introducing aids and equipment to ease their burden.

The first point of the program called for establishing a meaningful schedule of contacts within the cartographic community to keep abreast of pertinent developments. Contacts were quickly established with all the local major mapping organizations and pro- ducers of graphic materials and equipment. The Branch was con- fident that any new developments, even in their infancy, would be known by the Lab. It was not uncommon in those days for the Lab to be testing a new product well before it was put on the market. Three prime local contacts were developed or expanded: Mr.

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Samuel Sachs*, USC&GS, already a good friend of the Division;

Mr. Lionel Moore, US Geological Survey (USGS), Headquarters

Department; and Mr. John Scott, USGS, Atlantic Field Office.

A few years later, in 1958, Mr. [   ] visited the Aeronautical   (b)(3)
(b)(6)

Chart and Information Center (ACIC), St. Louis, Missouri,

where he met Mr. Robert Sovar, Chief of the ACIC Cartographic

Lab. This contact became invaluable over the years, and several

subsequent visits were made to St. Louis to work more closely

with Mr. Sovar and his men.

Professional meetings became a valuable source of infor-

mation.and Mr [   ] attended trade fairs, Visual Communica-   (b)(3)
(b)(6)

tion Congresses, and ACSM Conventions whenever and wherever

they were held.

The second point of the program specified the develop-

ment of new techniques and procedures and the training of Division

personnel to handle them properly. As the search for new ideas

began to pay off and new techniques and materials were discovered,

it became clear that introducing these into the production scheme

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* Mr. Sachs left government service around 1956 to become
Vice President of the Direct Reproduction Corp., New York.

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was another problem. The Lab then established a standard
routine of thorough testing under Lab experimental conditions,
production testing under the control of the production unit but
monitored by the Lab, then developing a new procedure or
modifying the then current procedure to accept the change.
As an immediate follow-up, all personnel involved were trained
in the Lab to properly understand and handle the change.

The third point of the Lab's program proposed the
issuing of reports and Technical Information Bulletins to keep
Division personnel knowledgeable. Quarterly reports were pre-
pared for the Chief of the Cartography Division showing the
status of all projects, listing trips and significant contacts,
and any other points of interest. In an effort to keep Division
personnel informed and to increase general technical knowledge,
a series of Technical Information Bulletins was issued. A wide
range of subjects was covered by these Bulletins, from Soviet
Scribing Plastic (February 1960) to Colored Pencils for Use on
VanDyke Film (March 1964) to Deep-etch vs. Surface Plates
for Map Reproduction (June 1960).

The fourth point stipulated that a comprehensive record
of experiments, successful and unsuccessful, be maintained. In

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contrast to the previous era when practically no records were

kept, the [   ] era maintained a comprehensive file of all ex(b)(3)
(b)(6)

periments. The saying at the time was that a full cabinet of

failures and unsuccessful experiments versus a small cabinet

of successes proved that the Development and Construction

Branch was doing its job to the fullest.

The fifth point called for establishing a workable file

of techniques, material, and vendors. The buildup of technical

knowledge and information, to be useful, had to be cataloged for

easy reference and retrieval. The Uniterm filing system was

investigated, found to be ideal for the Division's requirements,

installed and maintained by the Lab.

The sixth point was a commitment to be responsive to

Division needs and introduce cartographic aids and equipment to

further the effectiveness of the production operation. Needs were

continually surveyed, and a number of specifically designed and

constructed aids and pieces of equipment were introduced to sup-

port the specialized production of thematic maps. These will be

discussed later.

The last point of [   ] seven-point program conc(b)(3)
(b)(6)

the training of new personnel in the Division. The Lab retained

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the responsibility to train all new personnel. Training given

during this period, however, was more thorough because of

the greater technical knowledge and instruction of the Lab Chief.

3. **The Cartographic Lab Becomes a Two-man Section**

Although Branch production continued to increase by

virtue of greater demands placed upon the Division and there

was an ubiquitous shortage of drafting support, the Lab was made

a two-man Section between 1955 and 1959. The worth of a pro-

ducing Lab made itself felt in all areas of Division production,

and the value of the additional manpower to support this effort

was fully recognized by Division management.

The added manpower allowed Mr. [   ] to allot the (b)(3)
(b)(6)

bulk of his own time to the investigative and reporting areas of

the Lab operation, while his assistant, under his close direction,

performed the tests and production phases of the job and also
(b)(3)
assisted with training. (b)(6)

Mrs. [   ] (1955-56) and Mr. [   ] (b)(3)
(b)(6)

(1957-59) were both assigned from the Drafting Section. Mrs.

[   ] prime contribution was her work in developing an (b)(3)
(b)(6)

testing the scribing techniques which were subsequently introduced

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into the production process. She resigned from the Agency in

July 1956. Mr. [   ] major contribution was his complete   (b)(3)
                                                                    (b)(6)

revamping of the symbol files.

During this two-man period, the pressures of production

often forced the Lab assistant to forego his Lab duties and re-

turn to the Drafting Section to support a critical backlog of pro-

duction. Such pressures eventually forced the Lab back to its

one-man status in 1959, when Mr. [   ] was returned to the   (b)(3)
                                                                   (b)(6)

Drafting Section to resume full production.

4. <u>Significant Accomplishments of This Period</u>

    a. <u>Scribing Procedures Established for Thematic
        Mapping</u>

Although the basic principles of map production

were similar for both topographic and thematic mapping, indivi-

dual phases and the philosophy behind their operation were vastly

different. Scribing was developed by a topographic mapping

agency whose draftsmen worked for weeks, even months, to com-

plete certain complex drawings such as contours and culture. The

basic system developed in the early 1950's was to allow for contin-

uous, long-term production at greater speeds and higher quality

than ink drafting. Thematic mapping construction, in contrast,

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required only relatively short drafting operations. Maps which

required several days for individual drawings were considered

major projects. The topographic draftsman was assigned a

certain area of production, so that scribing drainage, if it were

his assignment, would be his full-time job. The thematic drafts-

man was responsible for the entire production of an assignment;

scribing drainage would be only one part. He would also scribe

the other elements -- boundaries, transportation, etc. -- as well

as prepare tone drawings and place all typography. Therefore,

the fact that a workable system of scribing was developed for

thematic maps, despite the basic problem of sporadic use, must

be considered a major breakthrough.

   After Mr. [_____] first contact with Mr. Sachs (b)(3) (b)(6)

revolutionary idea in 1952, the development was observed by the

Branch until Mr. [_____] took over the Lab in 1954. When Mr. (b)(3) (b)(6)

[_____] began his local investigations he heard from several (b)(3) (b)(6)

sources about a Swedish scribing technique which sounded very

similar to the USC&GS development and which was being hailed as

a cartographic revolution. As the Lab later learned from Mr.

Sachs, he had encountered extreme difficulty convincing his own

agency and the other major agencies of the value of plastic scribing.

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His demonstrations and time-saving estimates were virtually ignored. However, the official Swedish mapping organization, Esselte, had heard of this new development and invited Mr. Sachs to Stockholm for several weeks to demonstrate the system. The Swedes immediately recognized the value and potential of scribing, and they began a changeover from hand-drafting even before Mr. Sachs left. As the months passed and scribing became accepted at Esselte, Americans, who often visited this dynamic organization, brought home stories of the amazing Swedish idea called plastic scribing, when, in fact, it was an American idea to begin with.

In the mid-1950's scribing was being accepted by all the major US organizations, its potential finally being recognized. The Lab procured a set of instruments (gravers), point sharpening tools, and, of course, the ordinary phonograph needles. Using coated plastic from USC&GS as a test base (no commercial scribing material was available at that time), the instruments were put through a series of experiments.

The most critical part of the system, as it developed, was sharpening the phonograph needles and then maintaining the line weight during the scribing operation. A special sharpening jig which put a precise 45° rake angle at the base of the needle was

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purchased. This beveled needle in turn was placed in another jig and rotated on a fine sharpening stone until the desired line weight (width) was achieved. This was by no means the end of the operation, for the needle required continual examination and resharpening during the scribing operation.

Contrary to what one would think, the scribed line became finer, not broader, while the scribing was in operation. This anomaly occurred because of the coarseness of the coating, and the draftsman had to repeatedly examine his scribed line with a microscope to determine when to rehone the point to its original weight. This procedure was to have an adverse effect on the acceptance of scribing by the Division.

In early 1955, using the USC&GS coated scribing plastic and the above needle sharpening techniques, two drawings of the NIS base map of Chile, drainage and transportation, were scribed in negative form on an experimental/production basis by the Lab. The results were exceptional, and, despite the extra time required to maintain the scribing needles, time tests showed an appreciable saving in man-hours over ink drafting. The scribed negatives were then converted to positives by the Reproduction Plant and became part of the regular job.

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About this time Keuffel & Esser sent the Agency samples of two new scribing materials they were planning to introduce. One was a white coating on a new plastic base called Mylar. The other coating was rust in color on the same base. Scribing quality on both proved to be excellent.

The Division had a long-established procedure of compiling and drafting for reduction to final copy size. In the early days, this was done to refine poor linework and type quality, but even as skills to produce high quality hand-drafting increased and type quality improved, the procedure remained the same. The Lab found that by using the white Scribecoat (K&E's trade name for its scribing material) and backing it with black paper, a positive drawing in effect was achieved that could be handled and photographed the same as a hand-drafted original (Figure 5). Furthermore, the white material was translucent, and the draftsman was able to trace the manuscript by subduing the overhead lighting, thus eliminating the blueline transfer of the manuscript to the scribing base. This then became the system which was recommended and introduced into the construction of thematic maps.

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A scribing training program for all the draftsmen
and an indoctrination for all compilers was carried out by the
Lab. White scribecoat and several new scribing instruments
were purchased. The Lab spent many weeks sharpening sets
of needles to match the standard ink line weights established by
the Division, and the complete package was turned over to the
Drafting Section as operational -- but the system failed!

The original plan was to introduce scribing slowly,
and it was to be employed only where a marked saving of time
would be achieved. As a result of this decision, scribing was
used only occasionally. This was its downfall, because the drafts-
men found that to maintain their sharpening skills they required
more than a sporadic chance to scribe. They simply lost the
touch and, for the most part, it took more time to regain the
touch than to hand-draft the element in question. Trying to force
the issue did not overcome the problem. The draftsmen built up
a barrier against scribing, and it looked as though this great
potential was being lost.

Scribing limped along for the next two years as a
technique which was used for the exceptional rather than the rou-
tine job. A few draftsmen recognized the value of the technique

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and accepted scribing as a necessary evil, so several jobs

were processed during this period. Even with its faults,

scribing was ideally suited for preparing special straight-line

grids, and it was used whenever a request for one of these was

accepted. One such grid, produced in conjunction with Mr.

_____ the Agency's chief architect, became the base (b)(3)
(b)(6)

on which the new Headquarters Building was planned and de-

signed, and it remains in use today.

During a routine contact with the Engineer Research

and Development Labs at Fort Belvoir, Virginia, in the spring

of 1958, Mr. _____ learned of a new British sapphire scribing (b)(3)
(b)(6)

cutter being tested there. The cutter had arrived only a few

weeks before, and it had already scribed over 10,000 feet of line

with no change noted in line weight. The find looked promising.

Mr. _____ checked with Mr. Sachs, who had since left gover (b)(3)
(b)(6)

ment service to become associated with the Direct Reproduction

Corporation, New York, and discovered that Direct Repro was

already negotiating with the British firm to distribute Astrascribe.

(tradename) products in the United States. Mr. Sachs agreed to

send the Division a test packet of gravers and sapphire cutters to

begin tests, and these were received in May 1958.

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Results of these tests proved excellent. Each light weight plastic graver was designed to hold a specific cutter and, once this was installed and adjusted, required absolutely no additional maintenance. It was agreed then to set up one battery of gravers, each holding a standard line width, and production test the system. The sapphire cutters did the trick. The draftsmen, not needing to be concerned with anything more than selecting the proper line weight, were enthusiastic about the development and looked for instances to use scribing. The system was a total success and almost immediately changed a dismal outlook for scribing to one of immense potential. Several more sets of gravers, including swivel gravers to produce lines of over 0.015", were purchased and prepared by the Lab. These were in turn introduced into the operation.

The first year of sapphire cutter use saw an increase in scribing from almost zero to approximately 30 percent of all linework produced. The following five-year period saw a further increase to well over 50 percent. By 1965, virtually all single lines were produced by scribing, except lines over the 0.032" weight (approximately 10 percent of the total) which were still inked by Pelikan pens.

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In 1959 the Lab came up with the idea of multiple lines scribed by specially milled cutters. Double-lined scales and neatline and border combinations (Figure 6) were obtained from special cutters which Direct Repro ordered from Great Britain.

Many man-hours were saved by the use of the rigid, swivel, and combination-line sapphire cutters and white scribecoat to perform positive scribing, but more important, training a draftsman to achieve the highest quality workmanship was accomplished in a matter of weeks rather than the years it formerly took to train a draftsman to produce quality work by ink drafting. The thematic mapping production process had truly witnessed a revolutionary development. The Agency's Cartography Division was the first in the United States to introduce sapphire scribing into its operation. Even after many years of marketing, and as late as 1968, the major mapping organizations retained the steel phonograph needles. Their reason for not converting was that of expense, but each of these organizations had several persons assigned full time to sharpen needles and maintain instruments, itself a costly, time-consuming operation. Agency cartographers and draftsmen regarded this as a case of false economy.

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Several attempts were made during the early

sapphire scribing days to introduce negative scribing, but they

were unsuccessful because of the difficulty of transferring the

manuscript image to the scribing material and the need to

handle typography as additional positives when scribing nega-

tives. These difficulties were eventually overcome when K&E

began to market yellow scribecoat. The Lab tested the possi-

bility of performing scribing on this translucent material,

which was in effect negative scribing because the coating was

actinically opaque, then applying type directly to the yellow scribe-

coat as was done with the white scribecoat. The reproduction

negative was obtained by photographing the yellow scribecoat

through a filter to drop the color and hold the linework and type.

The process worked but there was no real advantage

over the positive scribing until efforts were made to process

more jobs on a 1:1 basis, i.e. compile, draft, and reproduce to

paper copies at the same size, with no reduction of the image.

The old adage, reduce to refine, was no longer applicable in the

age of scribing. Extremely high quality linework could be achieved

at any complexity with any combination of line weights. Therefore,

to realize the full advantage of scribing, which was primarily to

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produce a negative, the concept of 1:1 became established,and, as an added advantage, it saved substantial compilation and drafting time by reducing the amount of lines which had to be compiled and drafted.

Under the 1:1 process the yellow scribecoat was handled the same as described above. The type negative was obtained by photographing the image through a filter, the scribed lines disappearing against the copy board. The original scribed negative and the photographed name negative were then combined by double exposure to the press plate. This procedure added to the reproduction time, but there was a considerable overall saving of Agency manpower.

The yellow scribecoat technique prevailed until 1960 when K&E, which was rapidly taking over the commercial scribing market, introduced a new rust scribecoat containing a diazo sensitized coating (exposed by ultraviolet light and developed in ammonia fumes). Subsequent Lab tests determined that by modifying the compilation technique from inks to pencils, the manuscript image could be readily transferred to the new Helio

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scribecoat (Figure 7) by exposure from black light fluorescent

lamps and developed in a "pickle jar".*

This was a period of intense activity in the Lab,

and several major developments were underway concurrently.

Of significance to the introduction of the Helio (sensitized)

scribecoat were the facts that intermediate reproduction facilities

were being added to the Division's production process, and

recommendations to switch from pen-and-ink to pencils had

already been made to compilation to ease the burder there. The

processes involved in handling Helio scribecoat were very close

to being available at that time. These will be discussed in detail

later as separate developments.

Helio scribecoat changed the entire scribing proce-

dure by mid-1961. The manuscript prepared by the compiler

was transferred in reverse by the diazo process. The draftsman

proceeded to scribe the individual elements in negative form as

specified. At this point, film positives were created from the

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* The name given to any portable container in which diazo ma-
terials are developed by adding a few drops of liquid ammonia
and inserting material. Development is controlled by visual
inspection.

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scribed negatives on polystyrene film via the regular repro-

duction process or on Kodak washoff film by the draftsman

(this process will be described later). The set of positives

was then completed by the draftsman with the addition of type

and any other items specified. The result was a set of positive

originals which were forwarded to the reproduction plant for

processing under normal procedures. In essence, the scribed

negatives were only a means toward achieving the set of posi-

tives, but the time saved and the quality obtained made the

scribing process extremely valuable. This procedure remained

basically unchanged throughout the remainder of this reporting

period except for one advancement in wide-line scribing which

will be detailed later.

Scribing was indeed one of the historic advances

made by the Division, and it became one of the prime factors

permitting the Division to increase its production significantly

without an increase in personnel. The most important advantages

of scribing, as it was modified to support thematic map produc-

tion were: it was at least three times faster than ink drafting;

the quality of the final product was greatly enhanced by the excel-

lence of the linework produced; the making of corrections and

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changes was simplified; it allowed for the new concept of 1:1

production which saved untold man-hours; and it was much easier

to train personnel and allowed the Division to lower somewhat

its recruitment standards and procure draftsmen who would not

have been able to achieve the more difficult ink drafting level of

competence.

One disadvantage in the new mechanical scribing

approach to thematic mapping was the elimination of a certain

natural visual character of coastlines and drainage which could

only be achieved by ink drafting. This loss, however, was recog-

nized only by the cartographers and had no apparent effect on the

map users.

b.   The Introduction of Reproduction Support
        Facilities

The need for some sort of in-house reproduction

facilities was felt by the Cartography Division as early as the mid-

1950's because of the timelag in obtaining preliminary support

through the normal reproduction plant channels. This need inten-

sified as cartographic techniques expanded and as the requirement

to support current intelligence demands increased and deadlines

narrowed. As Division production mounted, so did the need for

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preliminary reproduction support from the reproduction plant.

There were requirements by compilation for composite film

positives on which to compile new substantive thematic data.

There was also a need by compilation for reduction or enlarge-

ment of source materials to bring them to compilation scale.

Shaded relief work required the processing of bluelines. The

Drafting Section required film positives of scribed negatives

and the processing of Peel Coats to produce tone drawings.

Current intelligence required immediate response for film posi-

tives on which to produce new graphics and the processing of

3M Color Keys to produce vugraph slides. The variety grew

yearly, but the understanding for the need lessened on the part

of the reproduction plant, which began to develop an unsympa-

thetic attitude. The reason was that the "minor" requests by

the Division, no matter how critical, cut into the normal pro-

cessing procedures of final reproduction work. The Cartography

Division tried in vain to persuade the Printing Services Division

to establish a small separate unit to handle these intermediate

phases of map production in order to ease the disruption at the

Plant and to give the cartographers the service they felt they

required.

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The idea of establishing reproduction facilities in

the Division was supported by all production personnel of the

Division but was opposed by one key individual. Mr. [   ] (b)(3) (b)(6)

[   ] who had moved up to the position of Deputy (b)(3) (b)(6)

Division Chief, felt strongly that the Division should not attempt

to impinge on Printing Services Division's responsibilities and

that all efforts should be put into convincing PSD to make the

necessary adjustments to support the Division. Nevertheless,

the Lab was directed by Mr. [   ] who replac(b)(3) (b)(6)

Mr. [   ] as Chief of the Development and Construction(b)(3) (b)(6)

Branch, to keep the problem in mind and its eyes and ears open

for possible solutions.

On his 1958 trip to ACIC, Mr. [   ] observed (b)(3) (b)(6)

development which was watched closely for the next two years.

Mr. Sovar of the ACIC Cartographic Lab had developed the pre-

decessor to the K&E Helio scribecoat. He had taken regular,

unsensitized scribecoat and hand applied a diazo coating. His

overall idea, however, included a simple "black box" with ultra-

violet fluorescent tubes which could be operated by the draftsman

to produce his own scribing image from the manuscript rather

than process the request through the ACIC reproduction plant.

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The problem was similar to the one the Division faced. Mr. Sovar's black box was only in the drawing stage in 1958, but two years later he had several in operation.

In 1960 the Direct Reproduction Corporation introduced a daylight handled material called Striprite used to create tone drawings mechanically. Until this time, all tonal areas were produced by outlining the area with a fine ink line then filling the area by brush with a turpentine opaque or by the use of Rubylith, a mylar base material with a coating that could be removed after cutting. These processes were tedious and time consuming but were commonly accepted as the only methods to perform the operation.

Striprite was developed to be used in direct association with scribing. If an open-water tone area was desired, for example, the draftsman would scribe only the coastline portion of the drainage. He would then make or have made a film positive. The positive would in turn be exposed to Striprite by a short ultraviolet light exposure. Two simple develop-and-etch steps produced a duplicate of the original scribed negative. At this point, the draftsman literally picked up the portion of the Striprite he did not require. The coating was easily peeled off

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the vinyl base by a sharp knife, thereby leaving a perfectly

registered, completed tone drawing. The implication was

enormous.

Also in 1960 K&E introduced its Helio scribecoat

which required an ultraviolet light exposure as the first step in

a two-step process. The introduction of this material would

greatly enhance the scribing operation.

At about the same time, the Eugene Dietzgen

Company began selling VanDyke film. This film was produced

on a mylar base for stability and was exposed through a negative

by an ultraviolet light source and simply developed in running

water. Lab tests of the processed material determined that

VanDyke positives were suitable for exposure to Striprite and

could also be used as intermediate positives for processing new

work.

The above three processes could have added another

dimension of production capability to the Cartography Division,

but not without the missing key, the ultraviolet light source. (b)(3)
(b)(6)

[blank] and Mr. [blank] endeavored to convince Mr. Sachs at the   (b)(3)
(b)(6)

1960 ACSM Convention, where his company was exhibiting its

products, that the Direct Reproduction Corporation should manu-

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facture and market a black box similar to the one Mr. Sovar

had added to the ACIC production operation. The Direct Repro

Box could be sold primarily to small organizations with the

same production problems that faced the Cartography Division.

Mr. Sachs took up the idea, and the exposure unit was ready for

demonstration and sale in the fall of 1960. The next step was to

convince Mr. ⬚ that the purchase of a black box for (b)(3) (b)(6)

Division was imperative to maintain technical growth and expan-

sion.

A demonstration of the Direct Repro Box, which in-

volved the processing of several of the company's materials, was

set up at the company's recently opened Falls Church, Virginia,

office. Mr. ⬚ Chief of the Cartography Divi(b)(3) (b)(6)

was invited to attend, in addition to Mr. ⬚ . The de(b)(3) (b)(6)

stration went off beautifully with the new U. V. exposure unit

performing flawlessly. Striprites were processed and peeled;

dye proofs, using another company product, were made; and diazo

images were exposed and developed. The advantages of the Divi-

sion installing such a system were manifest, and Mr. ⬚ (b)(3) (b)(6)

approved the "go-ahead".

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Mr. [ ] resistance was finally over-   (b)(3)
(b)(6)

come, and the black box exposure unit was installed in the

Lab early in 1961. The unit was constructed of wood and

contained a battery of ultraviolet fluorescent lamps. Material

to be exposed was placed on a clear-glass surface which

covered the lamps, and a heavy sponge-covered hinged lid was

pulled down onto the material and latched for pressure. A

side-mounted timer controlled the length of exposure. The

Helio scribecoat system was put into operation immediately.

Striprite (Figure 8) was purchased, and it too was made stand-

ard stock after a procedure was established for its use and per-

sonnel were trained. Dietzgen VanDyke film also became a

standard item. Furthermore, shortly after installation of the

new unit, the Terrain Section began preparing its bluelines via

the black box and obtaining better control than had been avail-

able through the regular reproduction system.

The installation of the black box, even in this rela-

tively primitive state, created a sudden feeling of pride through-

out the Division, which was no longer totally dependent on

another component to support its activities. The draftsmen,

who were closest to the development, quickly accepted the new

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procedures. Not only was the time it took them to process a map through Drafting further reduced, but their involvement in performing the new support operations also made their jobs more responsible and hence more interesting and challenging.

The system remained relatively unchanged until (b)(3) (b)(6) the early days of the [   ]ra when demands on the system began to outweigh its capabilities, and a major expansion of the facilities took place.

c. Pencil Compilation Techniques

Thematic map compilation did not witness the revolutionary changes over the years that the construction side did. Most of the changes that occurred were made to accommodate technical advances in map construction. During the 1940's and for most of the 1950's, compilers used Dr. Martin's and Artone colored inks to prepare compilation manuscripts. The procedure had become so ingrained that no one suggested an alternate method even though several compilers had a difficult time achieving acceptable quality ink linework. Relatively more time went into the techniques of preparing an esthetically acceptable manuscript than into the substantive accuracy of the project. This is not to

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imply that substantive accuracy was ignored but rather that mechanical techniques took too much time. Around 1958, when scribing made its impact, the inked manuscripts became increasingly difficult to use. Compilers were compelled to put tighter detail on their manuscripts for the 1:1 concept, and the draftsmen were finding this detail diffused and difficult to follow when scribing through the scribe coating. Tests were made in the Lab involving transfer of the inked lines to the scribecoat using the ACIC pre-Helio scribecoat method, but the light burned through the transparent ink lines and a poor image resulted. The Lab then recommended that a thorough study be made of switching from pen-and-ink to pencils for all compilation. Most compilers were enthusiastic about the possible changeover. (b)(3) (b)(6)

Mr. [   ] spent many days searching out all the makes and varieties of colored pencils he could purchase at local art supply and stationary dealers. Systematic series of tests were devised for hardness, durability, ease of sharpening, and opacity, and every color of every make was put through the experimentation. The tests showed that Eagle Verithin colored pencils gave the best all-around performance, and they were recommended for immediate use. Also recommended to accom-

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pany the new system were electric pencil sharpeners, located

at strategic positions within the compilation area, to save hand

sharpening time.

After several production tests the system was

adopted as standard operating procedure. The results were

gratifying to all concerned. The compiler was completely re-

lieved of his unwarranted efforts to produce quality linework by

the difficult to use pen-and-ink method, and his rate of output

increased perceptibly. The draftsman received a much finer,

denser line to follow, which made his job easier and required

fewer follow-up corrections.

With the introduction of Helio scribecoat in 1961,

the Eagle Verithins proved excellent in diazo line transfer.

However, a new hierarchy of colors had to be established because

of the range of opacity of different colors (Figure 9). Normally,

blue was used to compile coastlines and drainage, but blue made

a relatively poor diazo line transfer (this proved true in all

varieties of pencils). Because coastlines and drainage were

prime elements, it was mandatory that they appear solid and

sharp on the scribecoat for ease of scribing. Therefore, green

was selected as an appropriate color to use. This color selection

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procedure was followed for the other elements which made up

the manuscript worksheet, according to their relative importance.

For example, yellow was highly recommended for boundaries

because of its transferability, whereas prior to this time yellow

would have been outlawed for such an important role.

Several reexaminations were made over the next

ten years as new pencils were introduced, but Eagle Verithin

always proved to be the best.

In 1963, a similar study was made with ballpoint

pens in an effort to further reduce the compilers' problems in

preparing a manuscript. Even though diazo transfer was not

quite as high in quality as with the Eagle Verithins, a set of ball-

point pens -- a combination of BIC and Lindy -- was recommended

for use. Ballpoint compilation became the rage for a short time,

but gradually almost all compilers returned to colored pencils.

They discovered that, with continuous use of the pens, the ink

blobbed at the point and left smudges if not cleaned repeatedly.

When this occurred, maintaining a consistent line became diffi-

cult, and the manuscript took on a less professional appearance.

d. Revamping the Symbol Files

Division symbol holdings steadily increased after the 1952 reorganization of the files and the issuance of the Symbol Guide. As new problems arose, new symbols were designed and added, and, as expedients, intermediate sizes were produced from available symbols to satisfy special requests. Symbols were available in a wide variety of abstract and pictorial forms and sizes. They were also available in a selection of contrasting colors. As a result, they were widely used throughout the Agency as an aid in graphically communicating a broad range of subjects. For example, an analyst wishing to portray quickly the disposition of forces along a country border could easily apply the appropriate number of large red triangles to a copy of a printed map obtained from the library in a very few minutes. So many outside-the-Division customers were serviced that the Cartography Division became better known as the "Symbol Division" by many Agency personnel. By 1958 the file had again become unmanageable, and the Lab was again directed to put it in order. A significant upgrading of standards had occurred during the intervening six-year period, and it was found on close examination that the early symbol quality left much to be desired compared to the current quality. After

careful consideration, it was decided to reissue the old sym-

bols at current standards and to update the complete system.

Mr. [   ] who had just become the second Lab man,

(b)(3)
(b)(6)

was assigned this task in 1958-59. The massive undertaking

involved redrawing most of the original symbols developed

during OSS days and then progressing through the various reduc-

tions to achieve the full range of sizes. Several hundred new

panels were produced, which were in turn contracted to the US

Government Printing Office (GPO) for processing. At GPO the

panels were converted to photo engravings on 0.0152" zinc. On

their return to the Division, the engravings were microscopically

examined for quality, then routed to the Type Section for printing.

After printing the copy was again examined for quality before being

filed. At this point in the procedure the Branch was fully confident

that any symbol which had progressed to this stage was well within

the quality standards which had been established.

In conjunction with the remaking of the symbols

themselves, a new filing system was put into operation. The sys-

tem was designed for easy access by the draftsman and also to

make filing copy and reviewing the supply much simpler than under

the former system. Accompanying the file was a wing-panel dis-

play board which exhibited every size of every symbol on file.

In addition, a master catalog was produced which became the "Bible" on symbols. This was kept up-to-date and represented the complete catalog of symbol holdings. To complete the operation, a duplicate of the original master catalog was prepared, and one full sheet of every symbol was collected for the Cartography Division's Vital Storage Area.

Toward the end of this reporting period it was recognized that another major updating of the symbol files was urgently needed. Very little new symbol work had been accomplished since the 1958-59 revamping. New concepts in thematic mapping had outmoded many of the old symbols, and new representations, both abstract and pictorial, were sorely lacking. However, the chance to repeat the 1958-59 renovation seemed very unlikely because of inadequate manpower.

e. Type Placement Guide

There was an unwritten understanding throughout the entire history of the Cartography Division that the draftsman had the final responsibility for type placement. By virtue of performing this operation repeatedly he was supposed to have the most experience and the best judgment in properly positioning

the toponymy of a map in an unambiguous and esthetically

pleasing manner. This supposition was not entirely true, for

new draftsmen were expected to have the same ability as those

with many years of experience. Furthermore, the basic prin-

ciples of type placement, although covered thoroughly in the

Division training program, were often misunderstood by new

and old draftsmen alike. The problem lay in the fact that

there were no written guidelines which clearly and precisely

stated the principles of good type placement.

The problem came to a head around 1960 when

the Division was developing a high degree of sophistication in

its approach to thematic map production. Conflicts arose over

the question, "What is good type placement?" New ad hoc prin-

ciples were created to press a point, and eventually the problem

became critical. The Development and Construction Branch, in

an effort to alleviate the confusion, recommended the production

of a Division Type Placement Guide which would present in words

and graphics the type placement principles to be practiced in the

Division. The recommendation was approved, and the Lab was

assigned the project.

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Mr. [ ] began a thorough investigation into (b)(3)
(b)(6)

the type placement practices and came up with several guide

samples produced by other agencies. They all told "how"

but not "why", so the Division's guide had to be developed

from bottom up.

Hundreds of Division maps were carefully studied,

and the major areas of concern were isolated. Each of these

was developed to show the wrong way as well as the right way

to place a particular name. In several cases, full-color ren-

ditions had to be produced to demonstrate color overprint

problems. Overall, a highly scientific approach was taken

toward the problem. Production of the Guide, with its numerous

illustrations, took over a year and a half on a time-available

basis. It required many roughs, many consultations with drafts-

men and compilers, and many discussions with cartographers

outside the Division. The final Guide was a monumental achieve-

ment and was the first and only publication of its kind produced

by the Division.

The Type Placement Guide did much to formalize

type placement procedures in the Division. Compilers felt more

assured that agreed principles were being followed, and all drafts-

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men had the same handy reference which ruled on clearing

up problem areas.

5. Other Accomplishments During This Period

Many relatively minor developments were introduced

during the [   ] Era which, when totalled, added to the overall   (b)(3)
(b)(6)

efficiency of the compilation and construction processes of

thematic mapping. They are, however, too numerous to dis-

cuss in detail in this report.* Six developments are, neverthe-

less, worthy of mention.

a. Accent Sheets

The production of maps of foreign countries

involved the use, for the most part, of US Board on Geographic

Names recommendations for place-name spellings. For many

countries this meant the additional requirement to include

diacritical marks to indicate pronunciation -- a major problem

for the draftsman who, in many instances, spent as much time

adding diacritics by hand as it took to position the names. On

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* Details of these developments can be found in the Record
Center Archival Files, OBGI, Cartography Division, Item 71-437.

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some countries this became a serious handicap but one that could not be ignored or avoided.

At relatively great expense, accented letters were produced by American Type Founders of Elizabeth, New Jersey, for 8 and 10 point News Gothic, the style and sizes most commonly used for city names. This was of some help in easing the pressure, but it did not eliminate the problem because the cost to expand accents to other styles and sizes was prohibitive.

To solve this problem, the Lab in 1954 began the production of "accent sheets", as they were called in the Division. Preliminary study showed that the Division's type holdings could be divided into two family groups, serif and sans-serif, with each subdivided into light and heavy. Consequently, four sheets were planned. Thorough investigation went into the design of each diacritical mark, and large masters were produced following the scheme used for the production of symbols. Each sheet carried a range of sizes from 6 pt. to 24 pt. The four original panels were then converted to photo engravings, printed on standard celanese, and filed. Extreme quality control was followed during the entire process, and the

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completed sheets exactly matched the printed type on which they were to be placed (Figure 10).

The production of these accent sheets eliminated the slow hand-drafting formerly required and brought about a uniformity of end product never before achieved.

b.   Plastic Cutting Table

The introduction of plastic as a compilation and drafting base brought about a major change in the production process (II, A, 5, b), but it created a new problem -- that of cutting the material. Dyrite was stable and durable but, when cut with scissors, it shattered, leaving a jagged and dangerous edge. Many alternative methods were tried but the one that proved best, cutting against a steel straightedge, was the most time consuming.

At about this time an advertisement for the Metoschmit cutter, designed to cut plastics, was noted in a German publication received from the US Geographic Attache. The basic principle of the cutter involved a circular cutting knife which rode along a steel edge. The cutter seemed to be the solution to the problem, but because of its foreign manu-

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facture and a "Buy American" attitude that was prevalent at the time, it was very difficult to arrange a purchase. Persistence paid off, however, and the cutter finally arrived from Germany in late 1954.

Although very simple in construction, its quality was extremely high, and it cut Dyrite with a felt-smooth edge. A table was designed and built incorporating the cutter into one end, and another production problem was solved. (The cutter is still being used today, cutting the various plastics now in stock as effectively as it did in 1954.)

c. Craftsman Line-up Table

The relatively simple task of laying out a "square" map (all four corners exactly 90°) often became a problem for compilers and draftsmen when a very large map was in process or if extreme care was not exercised in handling the triangles and straightedges. Considerable time was wasted, many times at the final stages of a job, adjusting the neatlines and borders of a map when it was recognized that the original manuscript had not been squared and the draftsman had not checked it before drafting.

In 1957 the Lab recommended the purchase of

a Craftsman Line-up Table, a precision instrument for

squaring drawings. Although designed primarily for the

lithographic industry, it would work equally as well for car-

tography. The recommendation to spend the $2,000 was

approved, and the piece of equipment was purchased and

installed. From that time on layout ceased to be a problem.

The compiler used the table to construct his manuscript out-

line, and the draftsman followed up by using the table to ink

or scribe the neatlines and borders.

The Craftsman Line-up Table was equipped

with an automatic spacing mechanism which also enabled the

operator to create grids of extreme accuracy. Special grids,

many very tightly spaced, which would have required weeks

to produce by hand, were constructed in a matter of hours

by using the machine.

d.   Japanese Penpoint

Penpoints for freehand fine-line inking were

taken for granted. The use of the Hunt 102 and 104 and the

Esterbrook 356 had been established in the 1940's, and no

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thought was ever given to replacing them because they always
produced excellently. In 1959, however, among cartographic
items received from the Far East Geographic Attache was a
sample card of penpoints produced by the Japanese firm,
Toyo Seiko Co., Ltd. of Tokyo. The Lab tested them as a
matter of course and to its amazement found one to be superior
to any penpoint then in use. It was the Nikko 659. Further
tests proved the point to be easier to use, more durable, and
more consistent in line weight and quality than the stock penpoints.

A dispatch to the Geographic Attache to purchase a
supply produced a response that the penpoints could only be
purchased by the 100 gross lot. With scribing imminent and
the anticipated declining use of pen and ink in the offing, this
amount would have been overwhelming. Luckily the Attache
was able to convince the company to sell him 25 gross, enough
to last the Division for many years.

The Nikko 659 soon became the basic penpoint
for all fine-line drafting, increasing quality and easing drafting
training as it did so.

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e. <u>Rubylith</u>

The preparation of tone drawings by the pen-and-ink/opaque method was very tedious and time-consuming. By this method, the draftsman was forced to first outline the area with a fine ink line, then fill in with a turpentine opaque solution by sable brush. The more intricate the details of the area to be toned, the greater the increase in time it took to perform the operation.

A new material produced by the Ulano Company, called Rubylith, was observed at a 1959 Lithographic Trade Fair. The material had been developed and introduced for use in the photo lithographic industry to prepare negative masks. Rubylith consisted of a clear mylar base with a ruby red cuttable coating. When cut through to the base, the coating could be easily removed. It was recognized immediately as a feasible substitute for hand-drafted tone drawings. Tests proved successful, and Rubylith quickly became a standard material for drafting use. Rubylith did not fully replace the hand-drafted drawings, however. It was still found to be more efficient and practical to use the pen-and-ink/opaque method on very small areas where the use of Rubylith became too frustrating for the draftsman.

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Later, the Ulano Company introduced Amberlith, which was the same as Rubylith except that it was amber in color. Amberlith then became the standard because the lighter color was much easier to use over colored manuscripts. Again, in the case of the Rubylith and Amberlith, a saving of consider- able production time was realized, further reducing the length of time it took to produce a map.

f.   Conversion of Drafting Tables to Light Tables

The disappointing failure of electroluminescence in 1958 (II, B, 6) spurred an effort to replace the bulky light tables which were difficult to work against and space consuming. A portable light box, Porta-trace, marketed by the Ozalid Company, had been purchased for general Division use but was usually kept in the Lab on one of the Stacormatic drafting tables. In early 1961, while working on the box-on-table combination, Mr. [   ] had the idea of incorporating the Porta-trace un (b)(3) (b)(6) into the drawing table top and converting it to a light table. Plans were drawn, a piece of sandblasted plate glass was pur- chased, and the first unit was converted for the Division by the Department of State's Carpenter Shop. The converted table

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was an immediate success, especially to the research compilers and the Special Support Branch cartographers. The decision was then made to convert all drafting tables, and a total of 35 were eventually processed.

As a direct result, several large light tables were disposed of, and the Division was afforded a better and more efficient use of floor space in the new Headquarters Building. (The Drafting Section was not affected by this changeover, and the draftsmen continued to work over the cumbersome tables until 1971 when a more suitable table was found for the draftsmen.)

6. Electroluminescence: A Memorable Failure

Although the experiment with electroluminescence failed, through no fault of the Cartographic Lab, it is worth describing because of the nature of the problem and the implications which it carried.

Working over and through translucent compilation and drafting materials required the use of light tables in the Cartography Division. These tables were large, bulky tubs which contained batteries of fluorescent lamps and were sur-

faced with sandblasted plate glass. They occupied consider-

able space, they were difficult to work against, and they were

dangerous when the glass tops were accidentally broken. On

one occasion, a draftsman working on a large job actually

fell through one of the large tables and narrowly missed seri-

ous injury. Replacing the tables was for years a hopeful wish,

but there was no suitable substitute.

In 1956 the Lamp Division of the Westinghouse Corpor-

ation announced experiments with a new light source --

electroluminescence. The announcement described a flat

surface lamp, only slightly thicker than window glass, consum-

ing little power, and generating practically no heat. The

advantages of such a light source were immediately recognized

in the Cartography Division. This flat piece of glass which

would transform any flat surface into a "light table" would

effect a tremendous saving in space as well as provide a more

comfortable working area for the cartographer or draftsman.

Westinghouse was contacted in February 1957, and

representatives of the Division were invited to attend a demon-

stration of "Rayescent Lamps", Westinghouse's trade name

for its new light source. It was explained that the generation of

light by the phenomenon of electroluminescence was entirely different from conventional methods. There were no heated filaments, gas filled tubes, or metallic vapors. Instead, a thin layer of phosphor was sandwiched between two conductive plates; one made of a specially coated glass and the other of metal. When an alternating current was applied to the conductor plates, the phosphors were excited by the current and light was produced, the color of the light emitted depending upon the phosphor used. At the time of the demonstration, Westinghouse had developed a green lamp which operated at 600 volts and a frequency of 3000 cycles per second. The low-level illumination produced was unsuitable for cartographic use, but the Westinghouse engineers were confident that they would soon significantly increase the brilliance.

By the fall of 1957 progress had been made to the point where a new panel, operating at 600 V and 60 cps, gave the same illumination as the earlier panel at 3,000 cps. Several 1-foot-square panels to operate at 230V were purchased by the Lab at that time to demonstrate the principle, but because of the unavailability of suitable power equipment, no practical experiments were conducted.

Through a regular contact with Mr. Lionel Moore
of the USGS Cartographic Lab, the Division learned that they
were also experimenting with Rayescent panels and had been
deeply involved with their Electronics Section in developing
power equipment. It turned out that USGS was much further
advanced in their development of the system than was Westing-
house, and they offered to supply the Agency with 18" x 24"
lamps and powerpacks to operate at 600V and 60 cps, their
recommendation for maximum efficiency. Five large lamps
with powerpacks were ordered for Division experimentation.
In addition, two 12" x 12" panels with powerpacks designed to
transform European current (230 V, 5 cps) to 600 V, 400 cps
were ordered, and one was eventually sent to the Geographic
Attache in Europe for demonstration purposes.

In October 1958, Rayescent lamps and powerpacks
were put into use in all Branches of the Division on an experi-
mental/production basis. The lamps did not meet with imme-
diate approval from the compilers who needed a brighter
light over which to compile, and the panels were returned to
the Lab for powerpack modification to increase the frequency.
The Drafting Section and the Special Support Branch, however,

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reported the lamps to be very satisfactory, though they too

would have welcomed a brighter light. The lamps were in

operation eight hours a day for more than three months, and

future prospects seemed very encouraging. Plans were al-

ready being made to eliminate all light tables in the Division's

area in the new Headquarters Building.

Just as the new system looked most promising, one

of the units developed a short circuit which exploded the panel

and sent glass chips flying. Most fortunately the cartographer

was at lunch, and no injury was sustained. Of course, the

experiment was immediately shelved pending an investigation

into the cause of the malfunction. The cause was never dis-

covered, the system never became operational, and Westing-

house never marketed Rayescent.

7. The Era Ends

In April 1962, Mr. [   ] was offered an opportunity (b)(3)
(b)(6)

for advancement and transferred to NPIC, leaving the Carto-

graphic Lab virtually inactive for over a year. His tenure

had been an outstanding period of research and development

for the Cartography Division, which saw major changes in

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operating procedures, an enormous increase in production,

and a marked upgrading of quality.

C. The [   ] Era: A Period of Renewed Activity   (b)(3)
    (1963-1964)   (b)(6)

    1. Mr. [   ] Takes Over Lab on   (b)(3)
        Transfer From the Army Map Service   (b)(6)

        After Mr. [   ] departure, a thorough search of   (b)(3)
                                                                       (b)(6)

Division personnel was made to find a replacement for the Lab.

No candidate was found, so the search turned outward. Infor-

mal contacts were made with other mapping agencies to inform

them of the vacancy. Three cartographers applied for the

position and after a series of interviews, Mr. [   ]   (b)(3)
                                                                       (b)(6)
[   ] of the Army Map Service (AMS) was selected.   He

reported for duty in April 1963.

        Mr. [   ] had been with AMS for more than 20   (b)(3)
                                                                       (b)(6)

years and had a thorough background in topographic mapping

techniques and procedures. It took him a few months to become

familiar with thematic mapping procedures as they were handled

by the Cartography Division, especially the informality of operation.

        His first order of business was to re-establish contacts

with the various local mapping organizations and the second, to

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prepare an updated program for the Lab. These he accom-

plished without delay. The Lab program covered the identi-

cal points that were established in 1954 (II, B, 2) but with major

emphasis on streamlining and increasing the efficiency of the

construction operation. Mr. [   ] approached the challe (b)(3)
(b)(6)

with the disadvantage of not having had much previous experience

in thematic mapping.

2. Significant Accomplishments of This Period

a. Expansion of Reproduction Support Facilities

The Lab area, having been designated the location

of the UV Black Box exposure unit, became the center of acti-

vity for reproduction support work. Scribing was expanding

rapidly, which meant that the processing of Helio scribecoats

increased correspondingly. Contacts with commercial sales-

men gave some indications that new daylight handled materials

were being developed which would eventually benefit the Division.

Meanwhile, quality standards were rising, and it was felt that

the black box and "pickle jar" systems had reached their limits.

In the fall of 1963, Mr. [   ] began a study to determine   (b)(3)
(b)(6)

requirements for upgrading the Division's facilities to support

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the anticipated buildup in reproduction work. His recom-

mendation included the adoption of three basic elements:

1) the Ozalid Streamliner 100, a 30" diazo processor; 2) the

30" x 40" nuArc Flip-Top Platemaker, with vacuum frame and

carbon arc light source; and 3) the 6' Leedal processing sink.

These three basic units would support a variety of operations

in a minimum of space. The recommendations were approved,

and the items were purchased and installed by mid-1964. This

complete unit gave the Division a new dimension of support

and allowed its cartographers and draftsmen to become more

self-reliant and less dependent on the reproduction plant.

The Ozalid machine allowed for the in-house

production of Vugraph slides and enabled the Division to respond

more rapidly to support top-level briefings. The Ozalid was

also used to prepare quick diazo proofs directly from original

drawings, a luxury never before experienced. The contact

printer not only exposed Striprite and Helio scribecoats,

which were processed through the developing chamber of the

Ozalid, but also became the focal point for the exposure of

Wash-Off film and Duplication Scribecoat which will be dis-

cussed later.

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An interesting sidelight developed while Division representatives were working with the nuArc salesman. The nuArc Flip-Top Platemaker was purely a piece of lithographic reproduction equipment, as were the Ozalid and the processing sink, and as such they had to be approved for purchase by the Printing Services Division (PSD). There was some concern in the Cartography Division that PSD would not give this approval because they might not fully understand the use to which these items would be put in cartographic production. To counter this possibility, the nuArc Company was ready to prepare a new name plate for its printer, calling it the Cartographic Flip-Top Printer. Fortunately, an advanced reading from PSD proved the feeling was unjustified. Approval was given, and the printer was not renamed.

    b.   Kodak Kodagraph Wash-Off Film

In late 1963, the Eastman Kodak Company introduced a new film which was to cause major repercussions in the Cartography Division. This new film, Kodagraph Wash-Off, was daylight handled and therefore did not require a darkroom for processing. In fact, processing was so simple

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the first announcements were thought to be in error. The

film required a ten-second exposure in the vacuum printer,

one minute's submersion in an activator, then was washed

in warm water and dried -- all this in ordinary room light.

Moreover, the film was on Estar, the most stable of Kodak's

bases. The material seemed ideal for Division use, and a

roll of the film was ordered. Tests proved beyond a doubt

that Kodagraph Wash-Off film should be added to the pro-

cesses available for Division use. The resultant wash-off

positives (Figure 11) were of extremely high quality -- equal

to any processed by PSD. As a result, Dietzgen VanDyke

film was dropped.

The addition of Wash-Off film made an immediate

difference in the Division's operations. The Special Support

Branch was able to produce positives from available negatives

in a matter of minutes in response to urgent current intelli-

gence requests. The Drafting Section made its own positives

from scribecoats, thus eliminating the long delays encountered

when these were processed via PSD. Job scheduling became

easier, and calendar time to produce an average job was cut

significantly. The Terrain Section processed its own bluelines

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by means of a Wash-Off negative, also eliminating production delays. Composite Wash-Off positives, made by multiple exposures, were used for editing scribed drawings. In other words, the material was so versatile and its processing was so simple that Kodagraph Wash-Off film found its way into every phase of production. By the end of this reporting period the Division was using 10,000 sheets of this film a year.

c. Cronaflex Film for Compilation

Other than switching from ink to pencils there had been no change in manuscript preparation since Dyrite was introduced in the early 1950's. Even though a high quality pencil image was being produced on Dyrite, its grain, which was ideal for final drafting, rapidly wore down finely sharpened colored pencils, thereby requiring the compiler to spend an inordinate amount of time sharpening pencils. A better compilation base had therefore been on the Lab's "most wanted" list for many years. In 1964, the Dupont Corporation added Cronaflex U/C to its line of Cronaflex films. This new material was stable because of its mylar base and contained a very fine chemically produced grain. It proved to be the ideal

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replacement for Dyrite. Not only did the Cronaflex U/C

surface allow the compiler longer periods of time between

pencil sharpenings, but it also produced more brilliant lines,

enabling the draftsman to perceive them more readily. The

Cronaflex U/C manuscript image also made a higher quality

diazo transfer to the Helio Scribecoat, its finer grain being

less diffusing.

d. Experimentation with Silk Screening

In the late 1950's and early 1960's, an increas-

ing demand was put on the Division to provide supporting

maps in very small quantity for special intelligence reports

-- three to five copies being the usual requirement. Pro-

ducing the maps, which involved the overprinting of existing

Agency, Army, or Air Force maps, was a routine matter,

but obtaining the few copies became a problem. These

requests were almost always accompanied by extremely

short deadlines, and the decision whether to produce hand

copies or to have PSD overprint the existing maps had to be

made on the basis of the manpower situation in both Divisions

at the time. A possible solution was to employ the silk screen

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process, which seemed to lend itself to this type of low-run requirement.

Mr. [____] began a series of tests and exper (b)(3)
(b)(6)
ments with equipment borrowed from the Office of Logistics Visual Aids Group. Again the nuArc printer became the focal point as the drafted originals were exposed to Ulano Hi-fi stencils which were water developed and then adhered to the silk screen. Transferring the image was accomplished in the usual manner of applying paint to the screen and squeegeeing the paint through the open areas of the screen onto the paper map. Two problems had to be solved, however: registering the overprint with the printed map and finding a transparent paint which would not obliterate the base map detail.

A simple adjustable rig was built onto which the printed map was taped. The silk screen frame was also secured to the rig, but adjustments were added to enable the operator to shift the screen in all directions without detaching it. A few quick transfer tests put the overprinted image in its exact position on the map.

Finding a transparent paint was more difficult because the so-called transparent silk screen paints purchased .

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locally proved to be more opaque than transparent. Finally,

after numerous trials and errors, a truly transparent paint,

Naz-dar Transparent Silk Screen paint, was purchased from

a Baltimore, Maryland, supply house. The system was con-

sidered operational in mid-1964, but, unfortunately, at this

precise time the requirements to produce this type of map

support completely ceased. The system was never employed

although it was kept in readiness for several years thereafter.

3. The Cartographic Lab Again Becomes Dormant

Mr. [   ] decided in late 1964 that he was more (b)(3)
(b)(6)

production than research and development oriented, so he

applied for the position of Chief of the Drafting Section which

had been vacated. He was accepted and in November 1964

left the Lab to take over his new assignment.

D. Research and Development Continues Informally
   and Sporadically (1965-1970)

1. An Intensive Search for a Lab Man Is Fruitless
   But Research and Development Do Not Stop

A repeat of the exercise of 1962, when Mr. [   ] (b)(3)
(b)(6)

departed the Division, began. Division personnel were canvassed,

and the word was informally passed to the major mapping organi-

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zations, but to no avail. No one could be found who had the depth of training and experience and the strong desire to perform research and development work that were required. The search actually continued for several years until Division management decided in 1968, with the reluctant concurrence of the Branch Chief, to eliminate the Cartographic Lab slot and transfer it to the newly developing Automation Section of the Branch.

Eliminating the Lab position in no way eliminated the need for research and development. The Division had become too accustomed, over the previous 17 years, to being on top of thematic cartographic techniques for this situation to suddenly come to an end. It was decided, within the Branch, that the Technical Support Branch management would make itself responsible for keeping abreast of developments in the field. Although it was informal, a program developed whereby key Branch personnel became deliberately involved in R&D. This involvement took the form of out-of-town survey trips, local visits, and attendance at professional meetings. Only developments of a relatively major nature received follow-up R&D work in the Branch and these only by special assignment.

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Local contacts were maintained by telephone, and

visits were made when developments warranted.   Several

out-of-town survey trips were made which included foreign   (b)(3)
                                                             (b)(6)
and domestic organizations.   In the Spring of 1967, Mr.

Chief of the Branch, attended the

————————————————————————(b)(1)—————
                                        (b)(3)

During 1968, Mr. Deputy Branch Chief, (b)(3)
                                                             (b)(6)
surveyed US mapping programs and visited eight organizations

from coast-to-coast and Mr. visited three organiza- (b)(3)
                                                             (b)(6)
tions east of the Mississippi.   In 1969, Mr. Chief of (b)(3)
                                                             (b)(6)
the Special Projects Section, visited five mapping and adver-

tising organizations in the New York area, and the following

year, 1970, Mr. Chief of the Cartographic Constr (b)(3)
                                                             (b)(6)
tion Section, visited four organizations in the east and mid-west.

All VCC and ACSM conventions were also attended.

During this period R&D was handled on an unavoidably

haphazard basis.   Reluctantly, most ideas picked up as a result

of the above visits were recorded without follow-up because of

lack of manpower, but developments and trends were at least

known.   Division management was always well aware of the con-

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flict between R&D and production although, because of the

critical nature of demands on the Division during this period,

decisions almost always leaned toward carrying on production.

There were, however, four significant developments which

could not be overlooked, and time was found to investigate

and introduce them into the overall system.

2.   Significant Accomplishments During This Period

a.   Duplication Scribecoat

From the earliest days of the Division's history,

one particular problem arose repeatedly -- that of compiling

and drafting exact duplicate images. For example, if a

page layout included several small insets of a country, each

to present a different theme, the basic country outlines,

coastline, drainage, and boundaries were expected to be

exactly the same in every detail, even though the thematic data

varied. No matter how carefully the compiler produced his

manuscript and how painstakingly the draftsman followed his

lines, the final printed maps always showed variances. The

problem was solved in 1966 when Keuffel & Esser developed

Duplication Scribecoat.

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Duplication Scribecoat was a mylar base material with a diazo sensitized scribing coating. Exposure onto the material was made in the nuArc vacuum frame through a regular scribed negative, such as Helio scribecoat. The exposed material was then passed through the developing chamber of the Ozalid machine. The result was a duplicate negative. Multiple exposures of the scribed negative would result in multiple duplicates on the Duplication Scribecoat (Figure 12). The multiple exposures could be preplanned for position, and a step-and-repeat process could produce any number of images, all exactly the same.

The new material was first observed at the 1966 ACSM Convention. Samples were procured, and Mr. _____ (b)(3) (b)(6) _____ a draftsman who later became Chief of the Automation Section, was assigned to perform a series of tests and production experiments. He developed a procedure which involved an interplay between the compiler and draftsman.

In this new procedure, the compiler prepared a layout showing precisely where he wanted the images duplicated and then compiled a single line manuscript of the map base. This set was, in turn, given to the draftsman who scribed the

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map image only one time. He exposed the scribed negative

in the positions determined by the compiler using the Duplica-

tion Scribecoat. The processed negative was then transferred

to Kodagraph Wash-Off film. This produced a positive which

contained the proper number of identical images in their

exact positions. This positive was then returned to the com-

piler who, on a piece of Cronaflex U/C, completed his manu-

script. In the final drafting stage the multiple image positive

became the original drawing. Here again, not only was an

efficient procedure evolved that saved both compilation and

drafting manpower, but in addition the printed copy reflected

a more professional approach.

b. Slot Register System

The punch (hole) register system devised in the

late 1940's remained unchanged until 1967. Until the early

1960's, Dyrite plastic served as the compilation and drafting

base, and drafting was still primarily a hand-inking operation.

As new techniques developed and new materials were added to

the construction process, problems began to arise concerning

registration -- things were not registering as they should. It

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became apparent that the cause was the intermixing of base

materials -- vinyl, polystyrene, and mylar -- each with its

own coefficient of expansion and contraction. The variances

were enough, at their extremes, to throw the materials out

of register, and the two registration holes, being stationary,

caused buckling when this occurred.

The ACIC in St. Louis had under development

at this time a new system of registration based on the radiating

slot theory. The principle involved three oval slots, (1/4" x

1/2"), one at the top and one each left and right, all radiating

from the center of the sheet. Round or oval register pins

were inserted in the slots, and other drawings, similarly

slotted, were placed in position on the pins. Even though the

pins moved in the slots, the drawings were immovable with

respect to one another. In this situation any minute change in

size of the material was radiated uniformly in all directions,

and the drawings always appeared to be in perfect registration.

Differences could be microscopically calculated, but they were

well within thematic mapping accuracy standards. The system

was watched closely for more than a year after it became opera-

tional at ACIC.

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In the early spring of 1967, Mr. [ ] attend (b)(3)
(b)(6)
an "If-we-had-it-to-do-over-again" meeting at ACIC and noted

the many modifications they recommended for a second-genera-

tion punch. Following that several sheets of all materials used

by the Division were slotted for production tests. The tests

went well, and in April 1967 a slot-register punch which included

most of the ACIC recommendations. was ordered from the

Moffett Precision Company, Batavia, Illinois. The system was

installed in late 1967, and it revolutionized the handling of

materials in the Division as well as solving existing registration

problems (Figure 13).

All materials were prepunched before being distri-

buted so that no compiler or draftsman had to concern himself

with the task. It became the primary job of summer employees

to punch thousands of sheets of materials to provide a supply

which lasted throughout most of the year. Cutting of stock plas-

tic had been eliminated years before when the Division limited

its usage to four basic sizes which were purchased precut. *

Combinations of standard size materials could be built up at will,

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* Standard sheet sizes are 11" x 14", 17" x 21", 24" x 30",
and 30" x 40".

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beginning with the compiler's manuscript. Additional draw-

ings added at any stage of the process caused no problem.

Scribecoats for negative scribing could be flip-flopped and

still register perfectly.

The system was expanded to include photographic

film processed by PSD. The film was slot punched by the

Cartography Division and stored at PSD. When a slotted

positive was required, it was noted on the reproduction re-

quest. The returned positive then fit into the system and could

be handled with other materials.

The slot register system, by eliminating regis-

tration problems and allowing for the prepunching of materials,

saved at least 5 percent of the normal production time, thus

increasing production capability.

c.   Hollow-tipped Scribing Cutters

On his coast-to-coast survey trip in 1968, Mr.

discovered hollow-tipped scribing cutters at ACIC. (b)(3)
                                                     (b)(6)

They had been developed to scribe heavy lines on the automatic

plotter. Normal hand scribing of heavy lines was accomplished

by the swivel graver and chisel cutters, and line weights of

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0.024" and over were very difficult to handle. The new cutter,

designed by Mr. Robert Sicking of ACIC, was rigid with a round

hollow carbide tipped base. Mr. [ ] tested the cutters, (b)(3) (b)(6)

which had been inserted in regular rigid engravers, and found

them extremely easy to use at line weights up to 0.045". Follow-

ing detail was also much more accurate than with the swivel

gravers. He immediately adapted these new cutters as replace-

ments for the chisel cutters although ACIC had no plans to

make this change.

The addition of the hollow-tipped cutters overcame .

the last bit of resistance in the Division toward scribing, allow-

ing the full range of lines to be produced with relative ease.

d.   Diatype Photocomposing Machine

The Type Section was established during OSS days,

and, except for the addition of a new Vandercook 4T Proving

Press in 1947 and an occasional replacement of worn foundry

type, the unit's operation remained unchanged until 1970. This

stagnation was not deliberate. As early as December 1955 state-

ments regarding the search for a photocomposing machine to

replace the handset type system began appearing in Branch

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monthly reports. For several years in the early 1960's money

was carried in the budget to cover the purchase of a photocom-

posing system. Many leads were followed, and many demon-

strations were attended but no product matched the high quality

and low cost desired. Photocomposing had already replaced

hand type setting at the larger mapping agencies but the cost

of these systems, Harris Intertype and Merganthaler Linofilm,

was in the six-figure bracket. The Division wished to spend

only $5,000.

Late in 1969, on a visit to New York in connection

with the Division's consultant program, Mr. [   ] was intro-   (b)(3)
                                                                      (b)(6)
duced to a new German photocomposing system by Mr. Aaron

Burns, President of TypoGraphics, Inc. The system was

Diatype. The machine was the size of a typewriter, produced

extremely high quality 4 point through 38 point type from a single

glass disc, had a superior lens system, exposed directly onto

paper or film, and cost $5,000. A demonstration of the system,

distributed in the United States by the Royal Zenith Corporation,

New Hyde Park, New York, was later held in the Division, and

all personnel were given a chance to view the machine in opera-

tion. The type was indeed top quality, matching any photo

system regardless of cost.

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Mr. [   ] submitted a proposal for a comple (b)(3) (b)(6)
Diatype system together with recommendations for phasing out

handset type. In addition to the Diatype, the proposal recom-

mended the purchase of an automatic film processor, a small

nuArc vacuum printer with a pinpoint light source, and a

Stat King camera (a self-contained camera unit which would be

used to produce type over 38 point, the limit of the Diatype).

Two prime reasons were given for converting from hand set to

photocomposing: the average quality of Diatype far exceeded

the highest quality of handset copy, and type output would

double when the full system was in operation. Phase I of the

plan was approved, and the first Diatype machine (Figure 14)

was installed in April 1970. Sixteen discs representing 16

different type styles were included with the initial purchase.

By the end of this reporting period the Diatype photocomposing

machine and its makeshift darkroom in the Type Section had

surpassed even the most optimistic expectations. In less than

six months, more than half of all the type produced by the

Section was done by the Diatype system. The outlook for pro-

ceeding to Phase II, the purchase of a film processor, looked

bright for FY 72.

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The Diatype system, even when fully implemented, will not eliminate the Vandercook Press. Although no type would be printed, the Division and the Agency still have need for the millions of individual symbols printed each year on the press.

3. Maintaining a Position of Technical Leadership Becomes Increasingly Difficult

By mid-1970, a new technical revolution was rampart in cartography. To maintain production levels, major mapping organizations were putting added efforts into research and development in order to offset the loss of personnel by reductions-in-force. Automation was flourishing. If there was ever a period when the Cartography Division needed a dynamic Cartographic Lab, it was then. But developments were moving the Technical Support Branch in an opposite direction which even precluded the Branch Staff's continuation of its minor involvement in R&D.

A Division reorganization in April 1970 had placed additional responsibilities on the Branch. The Automation Section was increased in size, and it siphoned off personnel from the Drafting Section. Impending new plotter and digitizing systems would most likely take away more draftsmen. The Special Projects Section was doubled in size with the assignment of new

blocks of work, and it required additional guidance and super-vision. Additional Branch assignments which involved the Branch and Deputy Branch Chiefs further diluted any R&D effort.

Advances in the Division's automated cartography program alone warranted immediate R&D work to develop new technical procedures which would involve the interplay of compilers, draftsmen, and the computer-plotter. There was a growing fear among those closely involved in automation production and a strong possibility that the full potential of the system would not be realized because of this lack. By the end of 1970 much thought but very little effort was being applied to research and development work. The prospect of finding blocks of time, even for special R&D assignments, looked bleak for the future.

E. Ad hoc Procedures

Throughout its history, the Cartography Division was con-tinually faced with demands which seemed impossible to meet because of the nature of the requests or the deadlines imposed. Time after time, however, these "impossible" requests were

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fulfilled through the combined efforts of many inventive and re-sourceful Division personnel who improvised, took shortcuts, manipulated standard procedures, and developed ad hoc proce-dures to solve the problems. The Division's excellent reputation, in large part, was built on its ability to respond to these special requests. Division management, after accepting the requests, al-ways turned the problems over to the production level administra-tors and allowed them to proceed with minimum interference and red tape. This policy was probably the primary reason for the success the Division enjoyed when confronted with such problems.

These challenges forced developments. Photo-drafting, a means of obtaining images by reducing or enlarging portions of available original or negative drawings and then splicing them into plastic, was devised in the early 1950's as an expedient to meet certain urgent requests. This procedure was presented by an industrial graphics specialist at the Visual Communications Congress in 1963 as a "new" method to obtain drawings without the normal redrafting or rescribing. The term "map-mechanic" was coined during this period, and it reflected, in many cases, a true description of the operation performed. Duties and re-sponsibilities expanded and diversified to the point where, in

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1970, the cartographic draftsman position was officially changed to cartographic technician, a position which covered a much broader range of cartographic production.

Any and all means were employed to satisfy map requests. Many times it was necessary to contact other mapping organizations which performed operations not available within the Agency. It would be impossible to list all the special jobs processed over the years in this ad hoc manner, but two projects are described to give an idea of the problems involved.

1.   Khe Sanh Model

During the Khe Sanh crisis in Vietnam in 1968 the Special Assistant for Vietnam Affairs (SAVA) requested the Division to prepare a model for briefing the White House and the DCI. Preliminary meetings with SAVA determined that the model would be built on the AMS 1:50,000 Series L7014 of Vietnam, and AMS file negatives of the desired area were immediately requested. The Division had no model-making capabilities to construct such a detailed model in multiple copies, but it had, on several occasions, requested model production from the Naval Reconnaisance and Technical Support

Center (NRTSC). A contact with NRTSC indicated that they were willing to construct the base model and mold plastic duplicates, but they would be unable to produce the watercoat dye image proofs of the maps to be molded.

The number of copies required had snowballed, and as of that moment over 50 copies were planned for use in Washington and Vietnam. The Agency's reproduction plant had facilities to produce watercoat dye proofs, but not in this quantity. This led to another contact with AMS which agreed to make the map images and added 25 copies for Army use.

The negatives of the AMS 1:50,000 maps were used to produce film positives. As several 1:50,000 map sheets were involved, the Khe Sanh area was obtained by splicing the several positives together into a new single image. Transportation data for the entire map area and the details around the Khe Sanh base were updated, and the drawings were so adjusted. A separate contour image was scribed for NRTSC to use to construct the model, and the spliced drawings were sent to AMS to prepare the 75 proofs on plastic. Both organizations met their deadlines, and two weeks later the dye proofs were transferred from AMS to NRTSC for molding. Less than one month

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after SAVA had levied his request, completed plastic models, 40" x 42" in size and in multiple color, were ready for briefing.

(b)(1)
(b)(3)

Their prime map base, over which they planned operations, was the Air Force Operational Navigation Chart (ONC), 1:1,000,000. For greater accuracy, the ONC's were produced in 8° bands, each band having its own set of standard parallels. Although this made each map sheet of a band more accurate than would be the case with using one set of standard parallels for a large region or continent, sheets from one band could not be matched with sheets of an adjacent band because of the different curvature of their parallels. This feature of the ONC's was continually causing problems for [(b)(1) (b)(3)]e area of collection spanned two ONC sheets. Their question was, "Could anything be done to solve this problem?".

Appropriate Division personnel were assigned to review the problem, and an ad hoc procedure was developed

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which resulted in a new map [   ] produced over a s(b)(1)
                                                          (b)(3)
week period.

The basic plan was to extend one map approximately

10 inches north to cover the desired area of the other map.

The problem facing the Division was that of accurately extend-

ing the Lambert conformal conic projection, then making

the extension appear as part of the original map. Duplicate

sets of positives of the two ONC's were ordered from ACIC

through Detachment 1 in Arlington, Virginia. Having the posi-

tives meant that virtually no work was required on the one

sheet which was used intact. The positives of the upper sheets

were used in compilation as will be explained.

In 1969 the Division automated cartography program,

in the form of Automap, was making great strides, so it was

relatively easy to automatically machine plot a very accurate

projection extension. This plotted projection was stripped into

position on a composite positive of the basic map elements

(drainage, boundaries, names, transportation, and contours)

and given to the compiler. The ACIC positives of the northern

sheet were then photographically changed in size to fit 1° grid

squares of the extended projection. The map elements were

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then hand-transferred 1° square at a time to a sheet of Crona-flex over the composite positive, which became the manuscript of the new map extension, thus transforming the data from one series of standard parallels to the other.

While the compilation was underway, contact was made with the Naval Oceanographic Office (NAVOCEANO) to obtain their support on a new process they had recently developed from one they had picked up from USGS. The new process was called Scribe Etch, and NAVOCEANO was using it in their chart revision program where major portions of charts to be revised remained intact. The process produced an etched image on yellow scribecoat onto which the revised manuscript was transferred by a dye process. Scribing of the linework was then performed, and the revised areas blended perfectly with the unchanged areas. NAVOCEANO agreed to produce the Scribe Etch scribecoats the Division needed to produce its new map.

Once the compilation of the extended area was completed, a negative of the bottom ONC was produced by PSD and sent to NAVOCEANO for Scribe Etch processing. In the meanwhile, the new compilation was sent to PSD for negative photography, and preparations were made to transfer this image to

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the yellow scribecoats on their receipt from the Navy. This

process required approximately two weeks to complete.

The Scribe Etch scribecoats were then scribed,

element by element, by the draftsmen, matching the ACIC line

weights. Even with close examination it was almost impossible

to determine where the ACIC map had been extended. To make

the match complete, the typography portions of the upper sheet

were transferred to stripping film (a thin based, wax-backed

photographic material), and the ACIC's actual type was then

positioned. Hysometric (equal elevations bands) tones were

then produced from the newly scribed contours by the Striprite

method, and these were stripped into exact position on the tone

positives of the bottom sheet. As a final step, ACIC printing

inks were procured from St. Louis, and the final printing

[   ] printed by PSD, appeared to be an ACIC (b)(3)

produced ONC. [   ] was jubilant over the results, and another
(b)(3)

"impossible" request was fulfilled by the ingenuity of Agency

cartographers.

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III. Conclusion

Thematic cartographic technical developments would not
have advanced as forcefully and rapidly as they did without the
continued pressing need for thematic maps and associated
graphics to support Agency requirements. From the earliest
days of the Cartography Division's history, demands always
appeared to be beyond the Division's capabilities. The situa-
tion grew more serious during and after Admiral Raborn's
directorship when graphic-oriented Directors spurred the
demand for more cartographic and graphic support. The Divi-
sion met these challenges by concentrating on ways and means
to increase production, and cartographic research and develop-
ment was the avenue taken to achieve this goal. The Cartographic
Lab played a major role in this effort by introducing new aids,
techniques, procedures, and equipment to evolve a more
efficient production scheme. As a result, greater production
at quicker response time was realized, together with an increase
in quality. Production records clearly reflect the success the
Division had in its efforts. In FY 1952, 970 items were com-
pleted compared to 5640 items in FY 1970, with a relatively
minor increase in production personnel during the same period.

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In the 1960's, support to current intelligence demands

for instantaneous response continued to grow. New techniques

kept pace with this growth, and by the end of this reporting

period the Division was able to respond to the highest level

requests at a moment's notice, primarily by its in-house tech-

nical support capabilities. The Agency's Cartography Division

became the envy of other Intelligence Community organizations,

especially DIA, which had great difficulty producing adequate

support graphics in the time allotted and in the highly profess-

ional manner desired.

The Cartography Division's research and development

efforts always enjoyed full backing and support from Office and

Division management. However, the success of R&D efforts

depended almost entirely on the dynamism and ingenuity of the

persons carrying the responsibility at any given time.

The most significant period of development occurred from

1954 to 1964 with a year break between 1962 and 1963. During

this period, major advances in scribing and preliminary repro-

duction support facilities were introduced which completely

changed the manner in which thematic map production was handled.

A great effort was made during this period to keep abreast of

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developments in cartography and in the related fields of lithography and commercial graphics. Lab personnel were given full freedom and encouragement to develop with the minimum of management restrictions, a situation unlike that in other large mapping organizations where red tape and management restraints were deterrents to full personal involvement.

Many technical improvements introduced to the Division were expansions or modifications of developments found at other organizations, where larger research and development staffs had performed most of the preliminary work. This enabled the Cartography Division to take advantage of a much larger R&D effort than it ever could have expended on its own.

In 1968, when the Cartographic Lab was abolished for the want of a suitable Lab man, research and development slowed to a crawl with only the staff of the Technical Support Branch involved. The following two-year period saw several significant developments added to the Division's procedures but only through the major efforts of a few persons who worked in the time to follow up on these finds. In 1970, a Division reorganization increased the production responsibilities of the Technical Support Branch, and even the meager amount of time previously allotted to R&D was drastically cut.

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At the end of this reporting period the Cartography Division

was in serious need of a revitalization of its research and devel-

opment effort. Although the basic technical framework was

solid, this position would not hold forever, and there were areas

which had become antiquated from years of inattention. One of

these was the symbol file which had become outdated and did not

meet the newly developing design concepts of thematic cartography.

The advent of automated cartography, with its tremendous potential

to support the Division's needs, was also causing serious concern

because of the lack of manpower for developing techniques and pro-

cedures to utilize plotter and digitizer output to its full potential.

For many years the Cartography Division had enjoyed a position

of unquestioned leadership in the technical thematic cartography

field. By late 1970 the outlook for research and development was

bleak, and this position of leadership was in jeopardy of being lost.

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Comment on Sources

The research on this report was hampered by the lack of complete administrative and technical files for the reporting period. Fortunately, the author lived through most of the period and was closely associated with the technical aspects of thematic map production. His memory and personal files filled in many details missing from official records. A considerable amount of pertinent data was extracted from Cartography Division monthly reports, January 1945 through December 1959, the Cartographic Lab experimental file which covered the period from July 1954 through October 1964, * and numerous trip reports. Interviews with present and former Cartography Division personnel accounted for another significant bloc of information. The most important of these was the series of interviews with Mr. [   ] former Division Chief, who was very technically oriented and encouraged many of the developments cited.

(b)(3)
(b)(6)

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* Records Center Archival File, OBGI, Cartography Division, Item 71-437.

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LEROY PEN GAUGE

50% REDUCTION

25% REDUCTION
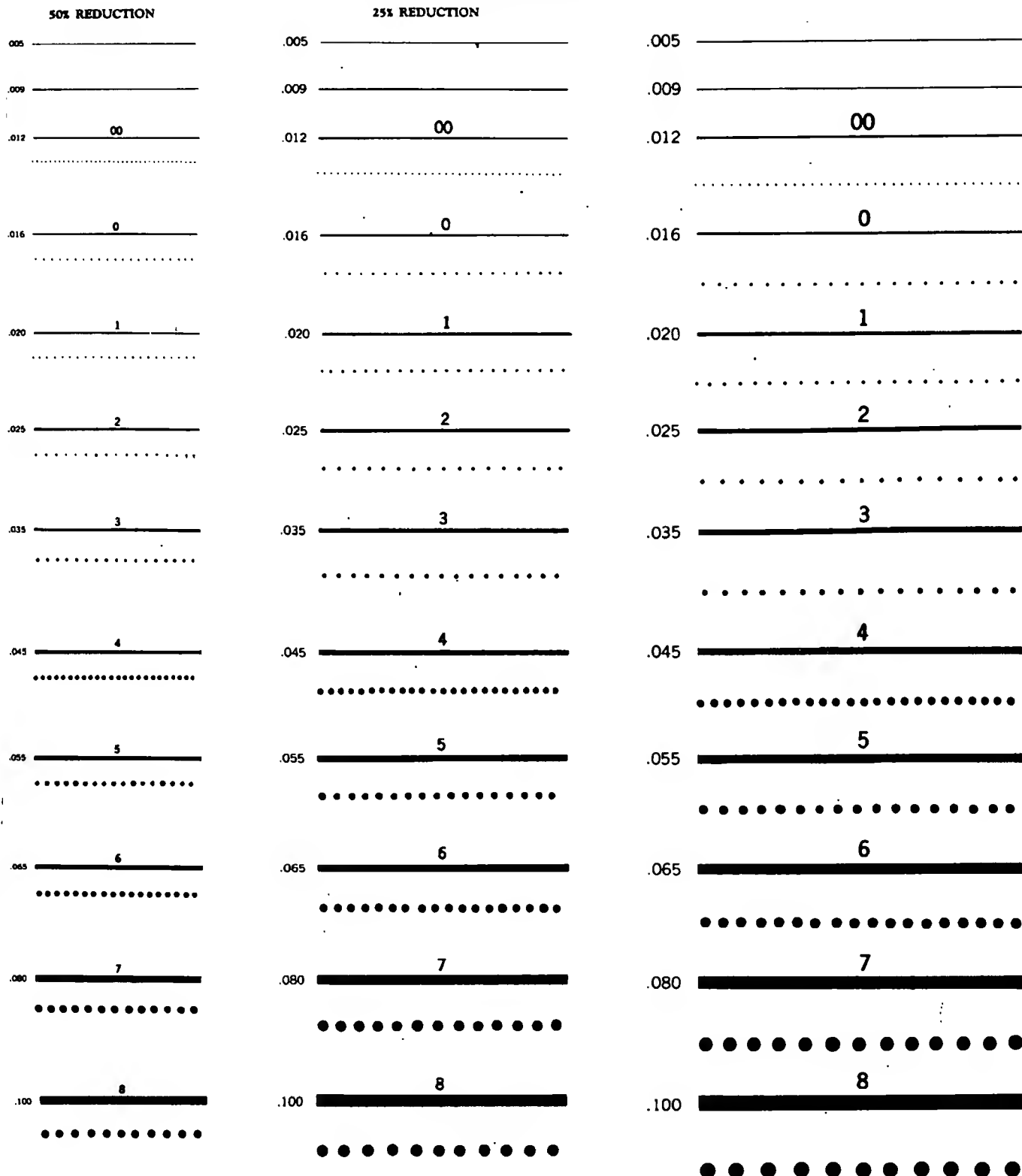
Figure 1. Line weight guide

NEWS GOTHIC

**Average Number of
Characters Per Inch**

6 Point

16 MEDITERRANEAN CASPIAN URAL'SK PHILIPPINES MOSCOW ATLANTIC OCEAN LONDON NORWEGIA

20 Mediterranean Caspian Ural'sk Philippines Moscow Atlantic Ocean London Norwegian Sea 246805000(

8 Point

14 MEDITERRANEAN CASPIAN URAL'SK PHILIPPINES MOSCOW ATLANTIC OCEAN LONDOI

18 Mediterranean Caspian Ural'sk Philippines Moscow Atlantic Ocean London Norwegian S 2

10 Point

11 MEDITERRANEAN CASPIAN URAL'SK PHILIPPINES MOSCOW ATLANTIC O

14 Mediterranean Caspian Ural'sk Philippines Moscow Atlantic Ocean L 2568

12 Point

10 MEDITERRANEAN CASPIAN URAL'SK PHILIPPINES MOSCOW ATL

13 Mediterranean Caspian Ural'sk Philippines Moscow Atlantic Oc 464

14 Point

8 MEDITERRANEAN CASPIAN URAL'SK PHILIPPINES MO!

11 Mediterranean Caspian Ural'sk Philippines Moscow A 24

18 Point

7 MEDITERRANEAN CASPIAN URAL'SK PHILIF

9 Mediterranean Caspian Ural'sk Philippin 246.

24 Point

5.5 MEDITERRANEAN CASPIAN URAL'S

7 Mediterranean Caspian Ural'sk P24!

30 Point

4.5 MEDITERRANEAN CASPIAN L

5.5 Mediterranean Caspian U246:

Figure 2. Sample type guide
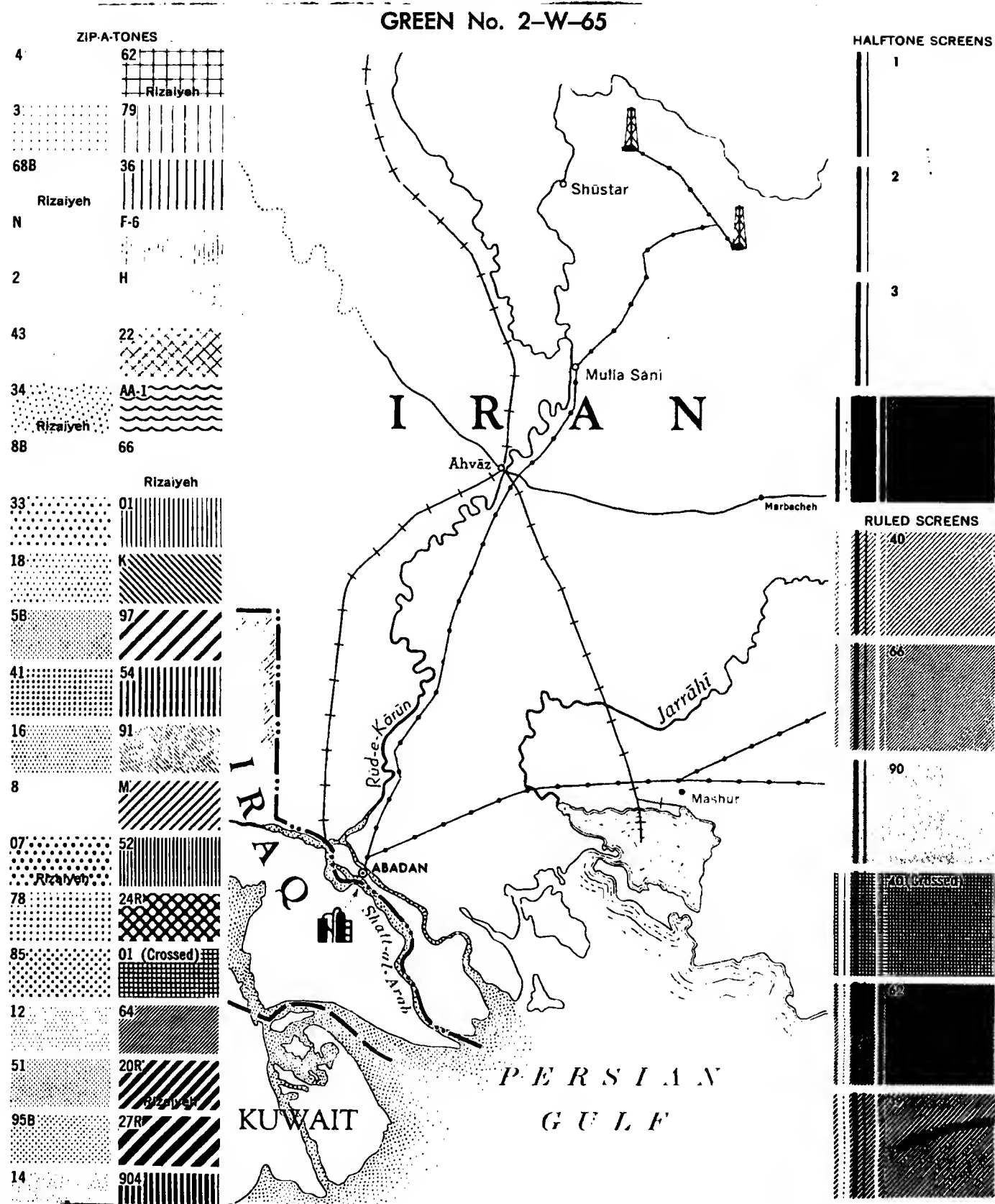
Figure 3. Sample color guide

SYMBOLS

Figure 4. Sample symbol guide
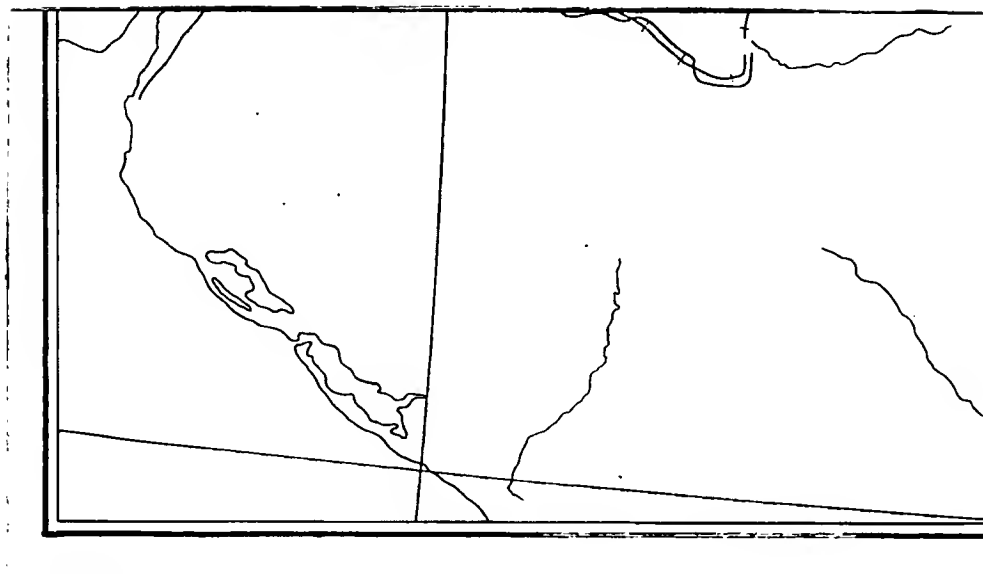
Figure 5. K & E Scribecoat (white). Note
how left half of scribed image appears
as inked lines when backed with black.
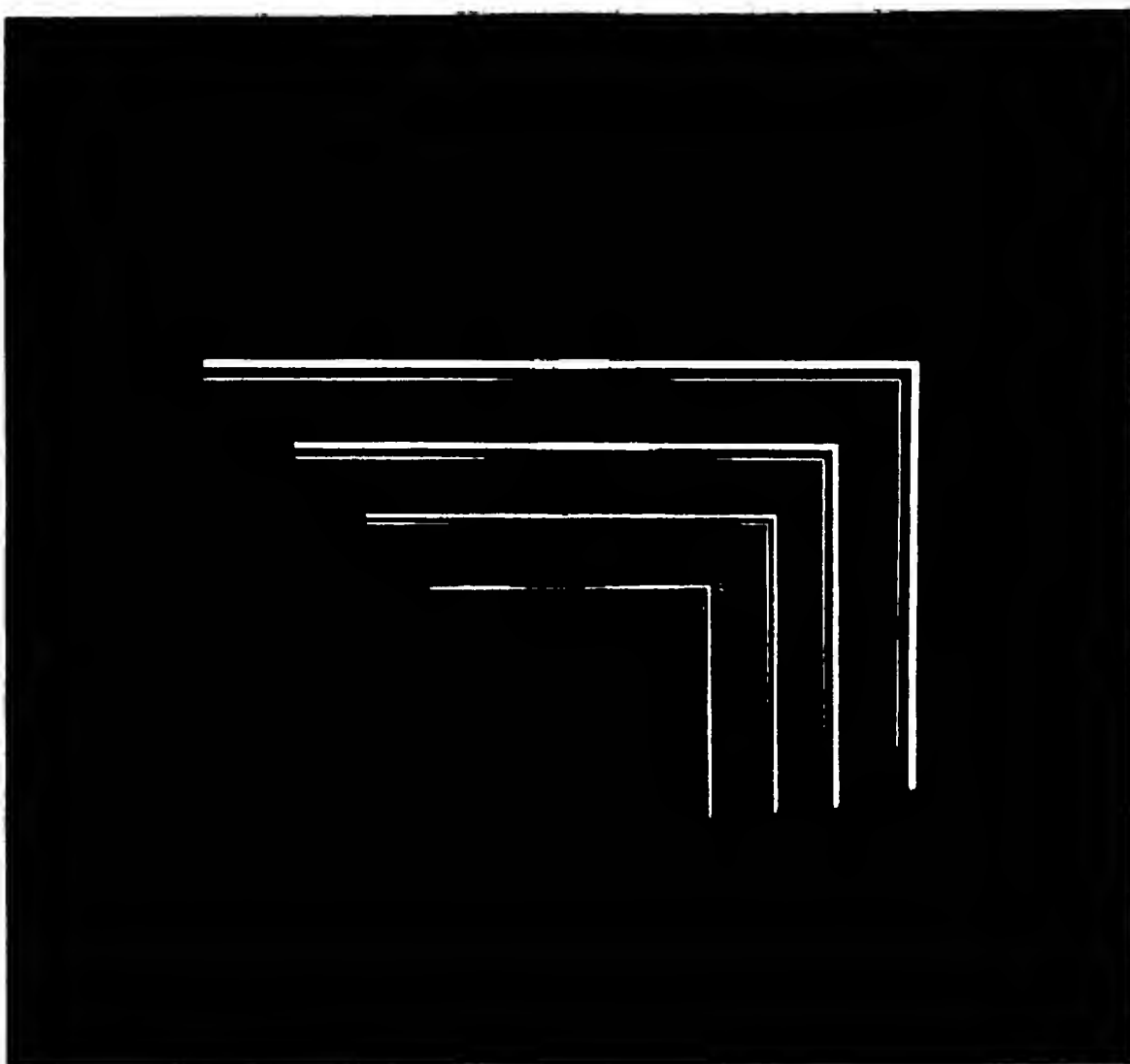
Figure 6. Samples of various combinations of double lines produced by one stroke of specially milled sapphire cutters.

Figure 7. K & E Helio Scribecoat (rust).
Manuscript image is transferred to Helio
scribecoat by carbon arc exposure and am-
monia vapor development. Image is scribed
in reverse to produce a true negative.

Figure 8. Direct Reproduction Striprite. Negative or positive is produced by stripping coating from base. One half of sample is stripped to demonstrate the technique.

Green ————————————————————————
Red ————————————————————————

Ci ...
Vermilion ————————————————————————
Dark Brown ————————————————————————
Black ————————————————————————

Figure 9. Top sample shows pencil lines as they appear on manuscript. Bottom sample shows quality of line produced when transferred to scribecoat. Note the illogical results—yellow a better image than red.

ACCENTS

GROUP 3—For use with GO, Ionic, and CGSI.

NOTE: In each case use next size smaller accent with CGSI.
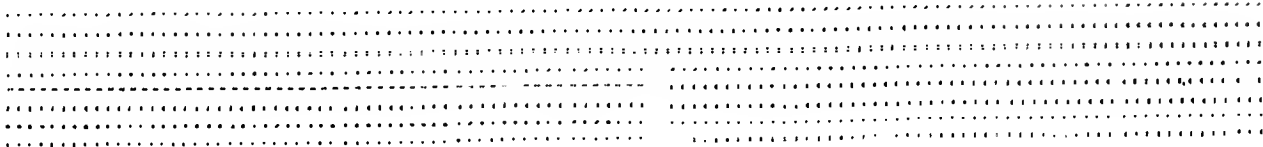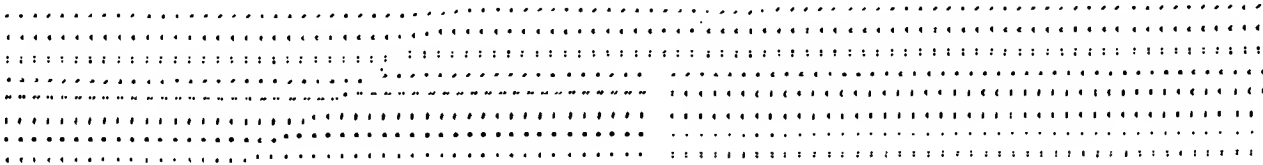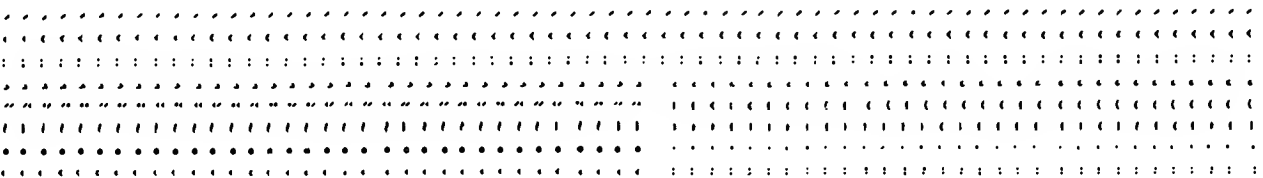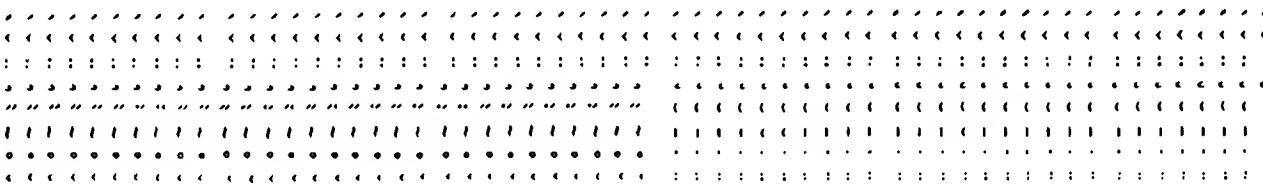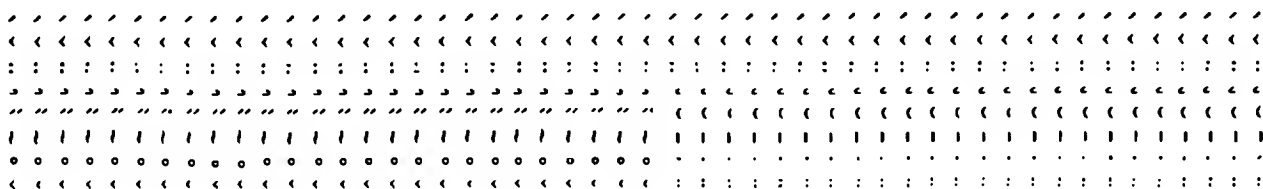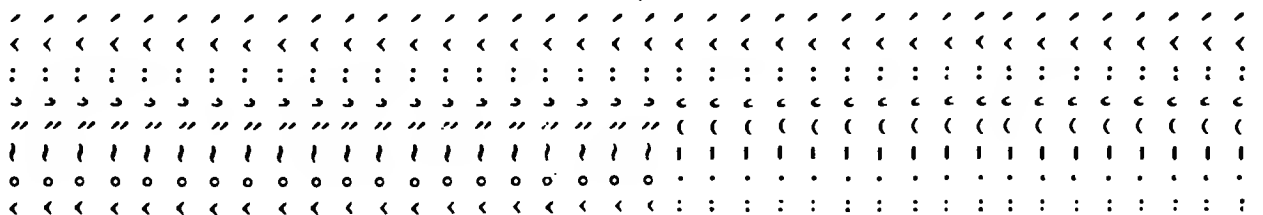
Figure 10. Sample accent sheet

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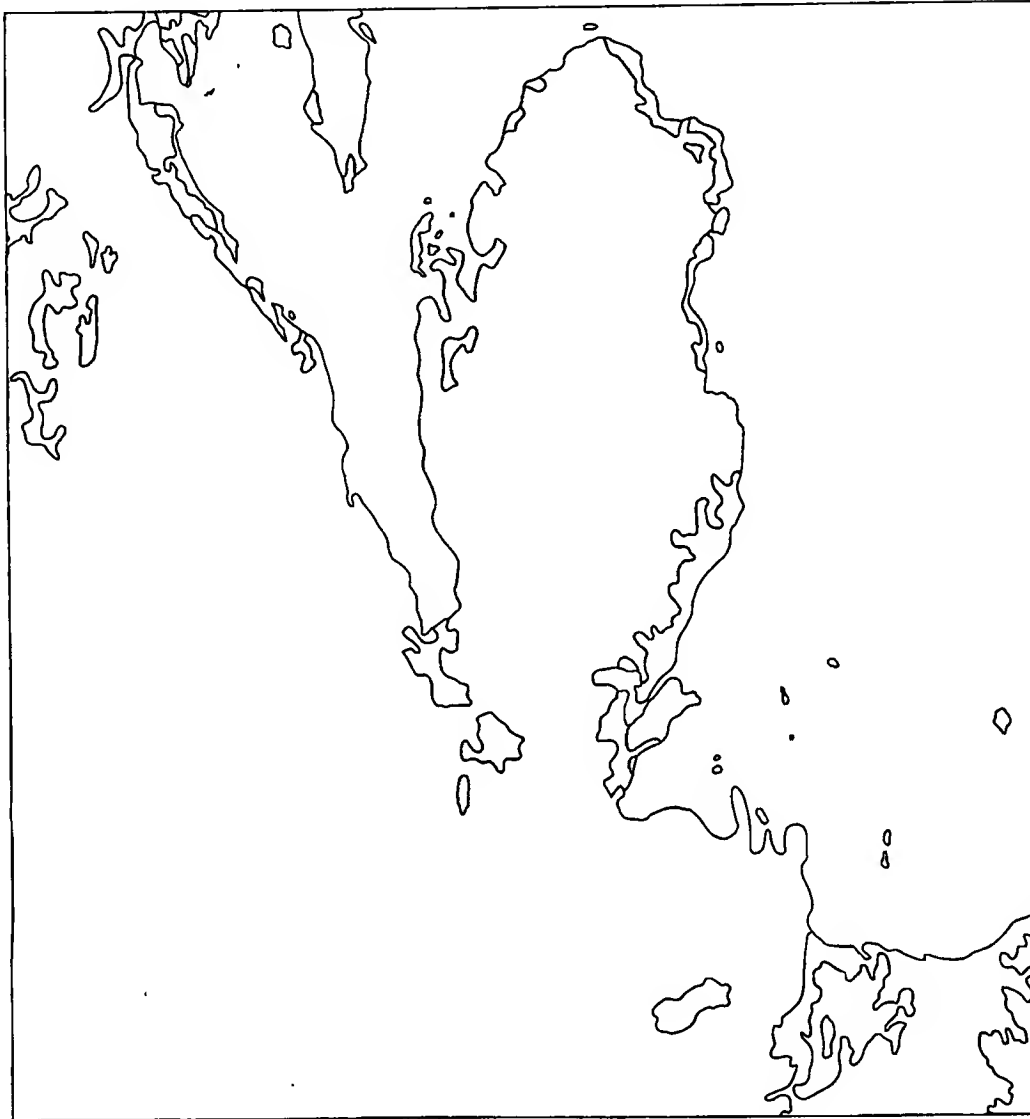
Figure 11. Kodagraph Wash-Off Film.
The high quality image equals any produced by conventional darkroom processes.
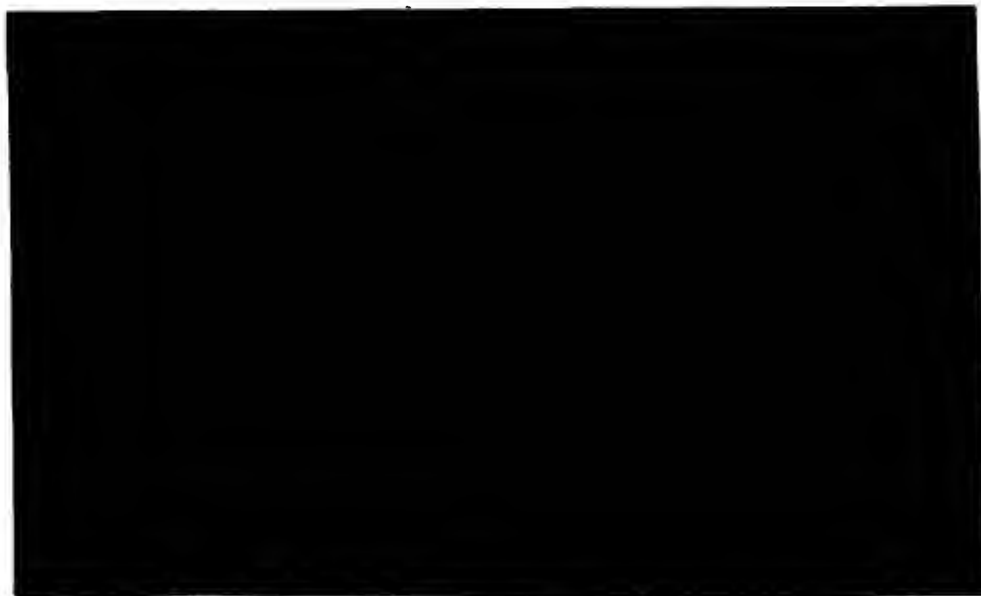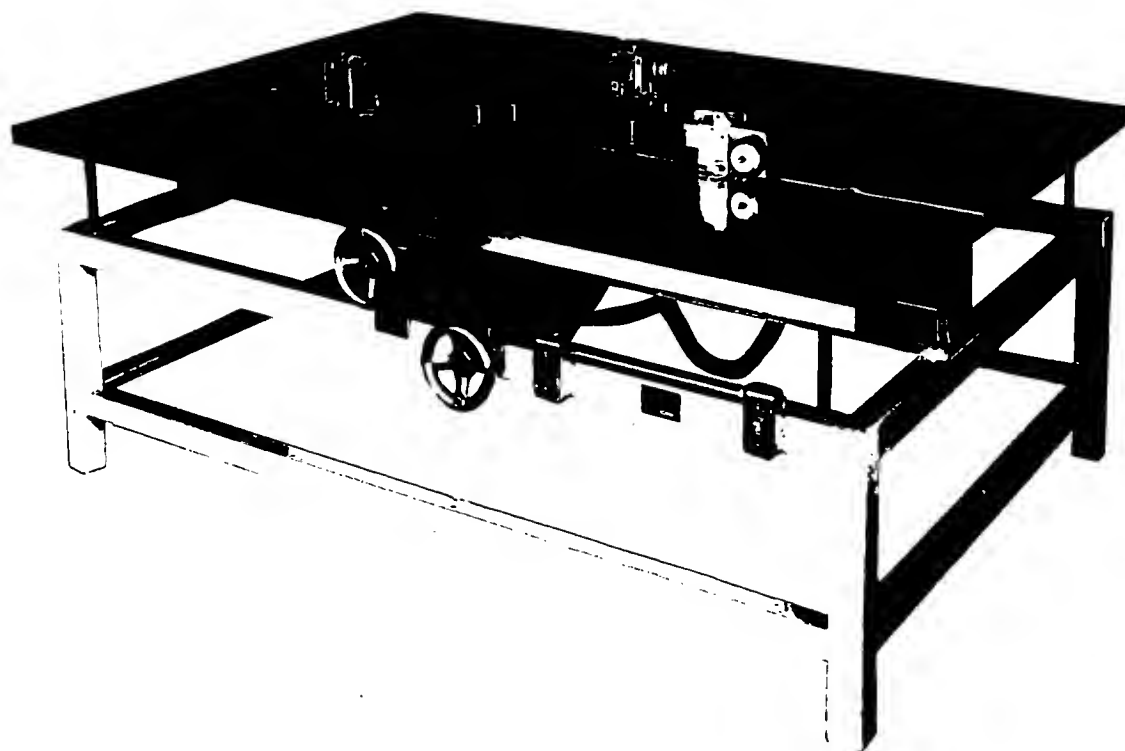
Figure 12. K & E Duplication Scribecoat. The four images of Cyprus were produced by a simple exposure of the scribed image below in their predetermined positions. Exact duplication of detail is assured by this method, while scribing each image individually would result in minor discrepancies from one image to the other.
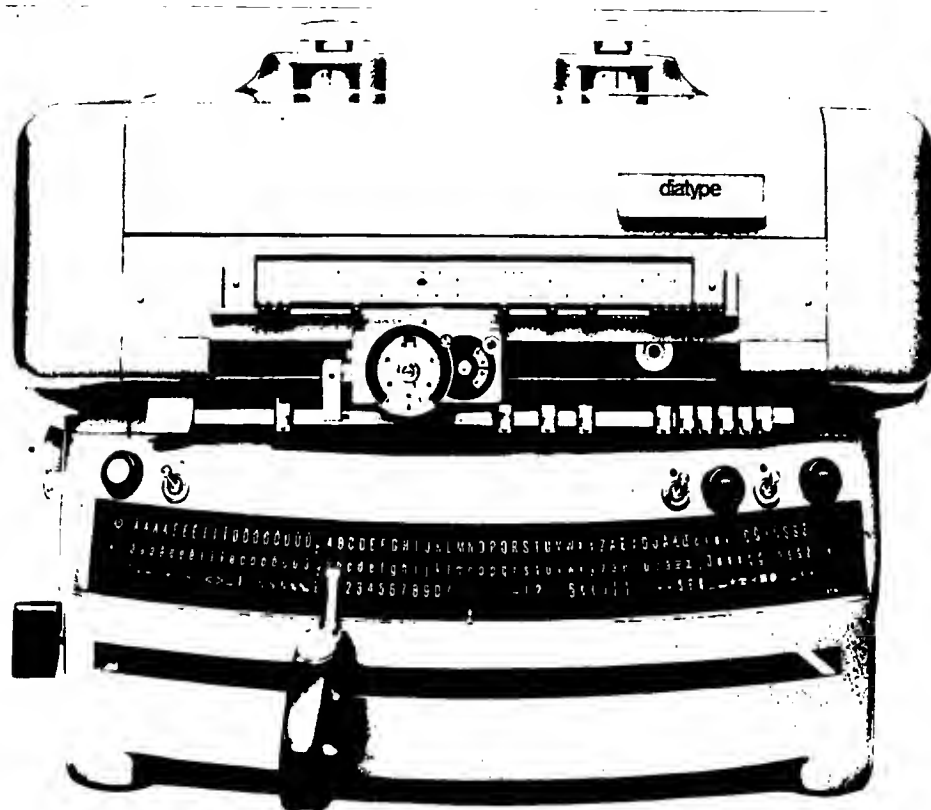
Figure 13. Moffett Slot Register Punch

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Figure 14. Diatype Photocomposing Machine